TETER, LLP
ARCHITECTS ENGINEERS CONNECTED

PROJECT MANUAL

CONTRACTUAL – LEGAL REQUIREMENTS
TECHNICAL SPECIFICATIONS

FOR

Porterville College Student Services Building – Rebid

Project No.: 22-12500
DSA File No.: 15-C1
DSA Appl. No.: 02-122754

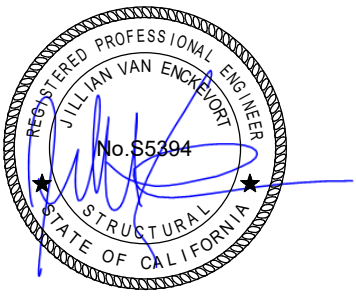
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IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 02-122754 INC:
REVIEWED FOR
SS ☐ FLS ☐ ACS ☑
DATE: 12/11/2025

SECTION 000107
SEALS PAGE



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Y *Symbol indicates items that must be submitted with Bid at time of Bid opening.*

./ *Symbol indicates items that must be submitted with Bid at time of Bid opening when required by Bid Documents.*

THE KERN COMMUNITY COLLEGE DISTRICT
BID REQUEST

Notice is hereby given that the Kern Community College District (OWNER) will receive sealed bids for the Porterville College Multi-Cultural Center and Interactive Garden project**.**

All bids must be received at the Kern Community College District Office, 2100 Chester Avenue, (entrance on east side) Facilities Department, 2nd Floor, Bakersfield, CA 93301 by 2:00 p.m. on Tuesday, February 03, 2026 and will be publicly opened at or after that time.

A Mandatory Job Walk will be held on Tuesday, January 20, 2026 at 10:00 a.m. and meet in front of the Maintenance & Operations Building at Porterville College, 100 E. College Ave., Porterville, CA 93257. The Plans and Specifications, including standard proposal forms, to be used for bidding on this project are available electronically from Kristina Antuna, kristina.antuna@teterae.com, 559-437-0887, 7535 N. Palm Ave. Suite 201, Fresno, CA 93711. No bid will be considered unless it is made on the bid form furnished by the District.

This is a prevailing wage project. OWNER has ascertained the general prevailing rate of per diem wages in the locality in which this work is to be performed for each craft or type of worker needed to execute this contract. These rates are available at www.dir.ca.gov. It shall be mandatory upon the contractor to whom the contract is awarded (CONTRACTOR), and upon any subcontractor, to pay not less than the specified rates to all workers employed by them in the execution of the contract.

This Project is subject to the requirements of Subchapter 4.5 of Chapter 8 of Title 8 of the California Code of Regulations. If subject to such requirements, Contractor and all subcontractors must furnish certified payroll records to the Department of Industrial Relations' Compliance Monitoring Unit (CMU) using the CMU's eCPR system – My LCM. To enroll in My LCM or obtain additional information and assistance, go to the third-party non-government website at https://app.mylcm.com.

The following notice is given as required by Labor Code Section 1771.5(b)(1): CONTRACTOR and any subcontractors are required to review and comply with the provisions of the California Labor Code, Part 7, Chapter I, beginning with Section 1720, as more fully discussed in the Contract Documents. These sections contain specific requirements concerning, for example, determination and payment of prevailing wages, retention, inspection, and auditing payroll records, use of apprentices, payment of overtime compensation, securing workers' compensation insurance, and various criminal penalties or fines which may be imposed for violations of the requirements of the chapter. Submission of a bid constitutes CONTRACTORS's representation that CONTRACTOR has thoroughly reviewed these requirements. In order to perform the work required by this contract, CONTRACTOR must possess the following type of license/certification issued by the State of California: B

The Board of Trustees of the Kern Community College District reserves the right to reject all bids and/or waive any irregularities in a bid.

Kern Community College District
By: Omar Flores
Title: Construction Project Manager

02-INSTRUCTIONS TO BIDDERS

WARNING: READ THIS DOCUMENT CAREFULLY
DO NOT ASSUME THAT IT IS THE SAME AS OTHER
SIMILAR DOCUMENTS YOU MAY HAVE SEEN
EVEN IF FROM THE SAME OWNER

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

1. Preparation of Bid Form.

The Owner invites bids on the form attached to be submitted at the time and place stated in the Notice to Contractors Calling for Bids. Bids shall be submitted on the prescribed Bid Form, completed in full. All bid items and statements shall be properly and legibly filled out. Numbers shall be stated both in words and in figures where so indicated, and where there is a conflict in the words and the figures, the words shall govern. The signatures of all persons shall be in longhand. Prices, wording, and notations must be in ink or typewritten.

2. Form and Delivery of Bids.

The bid must conform to and be responsive to all Contract Documents and shall be made on the Bid Form provided. The complete bid, together with any additional materials required, shall be enclosed in a sealed envelope, addressed and hand-delivered or mailed to the Owner at the address set forth in the Notice to Contractors Calling for Bids, and must be received on or before the time set for the opening of bids. The envelope shall be plainly marked in the upper left-hand corner with the bidder's name, the project designation, and the date and time for the opening of bids. It is the bidder's sole responsibility to ensure that its bid is received prior to the bid deadline. In accordance with Government Code Section 53068, any bid received after the scheduled closing time for receipt of bids shall be returned to the bidder unopened.

At the time set for the opening of bids, the sealed bids will be opened and publicly read aloud at the place indicated in the Notice to Contractors Calling for Bids. However, if this project calls for prequalification of bidders pursuant to Public Contract Code Section 20111.5, only those sealed bids received from bidders who have been prequalified for at least one day prior to bid opening shall be opened and publicly read aloud.

3. Bid Security.

Each bid shall be accompanied by a bid security in cash, a certified or cashier’s check, or bid bond in an amount not less than 10 percent of the total bid price payable to the Owner. The bid security shall be given as a guarantee that if awarded the contract the

bidder will execute and return the Construction Agreement within 10 working days after award of the contract and will furnish on the prescribed forms a satisfactory Payment (labor and material) Bond and separate Performance Bond, in accordance with the Contract Documents and Civil Code Sections 9550 et seq., and certificates evidencing that the required insurance is in effect in the amounts set forth in the Contract Documents. In case of refusal or failure to timely execute the Construction Agreement and furnish the required bonds and insurance certificates, the bid security shall be forfeited to the Owner. If the bidder elects to furnish a bid bond as its bid security, the bidder shall use the bid bond form included in the Contract Documents, unless the Owner elects to waive the use of the form provided, in its sole discretion.

4. Signature.

At the various times such documents are required to be submitted, the Bid Form, all bonds, the Designation of Subcontractors form, all Information Required of Bidder or prequalification forms, Workers Compensation Certificate, Drug-Free Workplace Certification, Non-Collusion Affidavit, Asbestos and Lead Based Paint Certification, Iran Contracting Act Certification, the Construction Agreement, and all Guarantees must be signed in the name of the bidder and must bear the signature of the person or persons duly authorized to sign these documents. Where indicated, if bidder is a corporation, the legal name of the corporation shall first be set forth, together with two signatures: one from among the chairman of the board, president, or vice president, and one from among the secretary, chief financial officer, or assistant treasurer. Alternatively, the signature of other authorized officers or agents may be affixed, if duly authorized by the corporation. Such documents shall include the title of such signatories below the signature and shall bear the corporate seal. Where indicated, if bidder is a joint venture or partnership, the bidder shall submit with the bid certifications signed by authorized officers of each of the parties to the joint venture or partnership, naming the individual (1) who shall be the agent of the joint venture or partnership, (2) who shall sign all necessary documents for the joint venture or partnership and, (3) should the joint venture or partnership be the successful bidder, who shall act in all matters relative to the resulting contract for the joint venture or partnership. If bidder is an individual, his/her signature shall be placed on such documents.

5. Modifications.

Changes in or additions to any of the bid documents, the summary of the work bid upon, or the alternative proposals, or any other modifications which are not specifically called for by the Owner, may result in the Owner's rejection of the bid as not being responsive. No oral or telephonic modification of any bid will be considered. However, prior to the opening of bids, a telegraphic modification signed by the bidder and postmarked and received prior to the opening of bids, or a facsimile modification duly signed by the bidder received prior to the opening of bids, may be considered if included within a sealed bid.

6. Erasures, Inconsistent, or Illegible Bids.

The bid submitted must not contain any erasures, interlineations, or other corrections unless each correction creates no inconsistency and is suitably authenticated and noted by signature of the bidder. In the event of inconsistency between words and figures in the bid, words shall control figures. In the event the Owner determines that any bid is unintelligible, illegible, or ambiguous, the Owner may reject the bid as not being responsive.

7. Examination of Site and Contract Documents.

At its own expense and prior to submitting bids, each bidder shall examine all documents relating to the project, visit the site, and determine the local conditions which may in any way affect the performance of the work, including the general prevailing rate of per diem wages and other relevant cost factors. Each bidder shall be familiar with all federal, state, and local laws, ordinances, rules, regulations, and codes affecting the performance of the work, including the cost of permits and licenses required for the work. Each bidder shall make such surveys and investigations, including investigation of subsurface or latent physical conditions at the site or where work is to be performed, as it may deem necessary for performance of the work at the price being bid. Each bidder shall determine the character, quality, and quantities of the work to be performed and the materials and equipment to be provided, and shall correlate its observations, investigations, and determinations with all requirements of the project.

The Contract Documents show and describe the existing conditions as they are believed to have been used in the design of the work and are only provided as information for the bidder. **The Owner is not making any warranties regarding this information. The Owner shall not be liable for any loss sustained by the successful bidder resulting from any variance between the conditions and design data given in the Contract Documents and the actual conditions revealed during the bidder's pre-bid examination or during the progress of the work.** Bidder agrees that the submission of a bid shall be incontrovertible evidence that the bidder has complied with and agrees to further comply with all the requirements of this section.

8. Withdrawal of Bids.

Any bid may be withdrawn, either personally, by written request, or by telegraphic or facsimile request confirmed in the manner specified above for bid modifications, at any time prior to the scheduled closing time for receipt of bids. In accordance with this paragraph, the bid security shall be returned for bids withdrawn prior to the scheduled closing time for receipt of bids. No bidder may withdraw any bid for a period of 60 days after the award of the contract. A bidder’s unawarded alternative bids remain open for a period of six months after award of contract as irrevocable offers to enter into either change orders or separate contracts for the stated price adjustment.

9. Agreement and Bonds.

The Construction Agreement and the form of the Payment and Performance Bonds which the successful bidder as Contractor will be required to execute are included in the Contract Documents and should be carefully examined by the bidder. The Payment Bond shall be in an amount not less than 100 percent of the amount of the contract in accordance with Civil Code section 9554. The successful bidder as Contractor will also be required to furnish a separate Performance Bond in the amount of 100 percent of the contract amount. Sufficient bonds shall be fully executed and returned to Owner with the executed Construction Agreement.

10. Interpretation of Contract Documents.

If any bidder is in doubt as to the true meaning of any part of the Contract Documents, or finds discrepancies in or omissions from the drawings and specifications, a written request for an interpretation ("RFI") or correction shall be submitted to the Owner. The bidder submitting the RFI shall be responsible for its prompt delivery. Any interpretation or correction of the Contract Documents will be made only by addendum issued by the Owner, and a copy of any addendum will be hand-delivered, mailed, or faxed to each bidder known to have received a set of the Contract Documents. No person is authorized to make any oral interpretation of any provision in the Contract Documents, nor shall any oral interpretation be binding on the Owner. If there are discrepancies on drawings, plans, or specifications, or conflicts between drawings, plans, specifications, terms, or conditions, the interpretation of the Owner shall prevail. Bidder shall become familiar with the plans, specifications, and drawings. Bidder shall not rely on summaries, if provided, of the plans, specifications, and drawings, but shall inspect each document independently to determine the full scope of the bid package and submit written questions to Owner, utilizing the RFI process described above, in the event of any identified potential discrepancies.

SUBMISSION OF A BID WITHOUT REQUESTING CLARIFICATIONS SHALL BE INCONTROVERTIBLE EVIDENCE THAT THE BIDDER HAS DETERMINED THAT THE PLANS, SPECIFICATIONS, AND DRAWINGS ARE SUFFICIENT FOR BIDDING AND COMPLETING THE WORK, THAT BIDDER IS CAPABLE OF READING, FOLLOWING AND COMPLETING THE WORK IN ACCORDANCE WITH THE PLANS, SPECIFICATIONS, AND DRAWINGS, AND THAT THE PLANS, SPECIFICATIONS, AND DRAWINGS FALL WITHIN AN ACCEPTABLE STANDARD FOR THESE ITEMS, AND THAT BIDDER AGREES THAT THE PROJECT CAN AND WILL BE COMPLETED ACCORDING TO THE OWNER'S TIME LINES AND ACCORDING TO THE PROGRESS SCHEDULE TO BE SUBMITTED BY THE SUCCESSFUL BIDDER INCORPORATING THE OWNER'S TIME LINES FOR COMPLETION OF THE PROJECT.

11. Bidders Interested in More Than One Bid.

No person, firm, or corporation shall be allowed to make or file or be interested in more than one bid for the same work unless alternate bids are specifically called for by the Owner. A person, firm, or corporation that has submitted a sub-proposal to a bidder, or that has quoted prices of materials to a bidder, is not disqualified from submitting a proposal or quoting prices to other bidders or submitting a bid on the project.

12. Award of Contract.

(a) The Owner reserves the right to reject any or all bids, or to waive any irregularities or informalities in any bids or in the bidding process, and to award more than one contract. If two identical low bids are received from responsive and responsible bidders, the Owner will determine which bid will be accepted pursuant to Public Contract Code Section 20117.

(b) If made by the Owner, award of the contract will be by action of the governing board or other governing body to the lowest responsive and responsible bidder. In the event an award of the contract is made to a bidder and that bidder fails or refuses to execute the Agreement and provide the required documents within the time required, the Owner may award the contract to the next lowest responsive and responsible bidder or release all bidders. An election by the Owner to reject all bids does not release the bid security of any bidder who has previously been awarded the contract and failed or refused to execute the Agreement and provide the required documents.

(c) In ascertaining the low bidder, the bids will be examined without reference to any substitutions requested by any bidder, whether or not the substitution request would result in a modification of the contract price.

13. Alternatives.

If alternate bids are called for, the contract will be awarded to the lowest responsive and responsible bidder on the basis indicated in the Notice to Contractors Calling for Bids. Owner reserves the right to award or reject any, all, or any combination of the alternates called for in the bid documents, whether or not the alternate(s) was included in the calculations used to identify the low bidder. All bid alternates not part of the contract initially awarded by Owner shall remain open and valid for a period of six months after the contract is awarded as irrevocable offers to enter into either change orders or separate contracts on the items for the price adjustment contained in the bid alternate.

14. Public Contract Code Section 20111.5—Discretionary Prequalification of Bidders.

[check one]

☒ Discretionary Prequalification is not required to bid on this project.

☐ Discretionary Prequalification is required to bid on this project. Prospective bidders are required to submit to the Owner a completed prequalification questionnaire and financial statement, on forms provided by the Owner, no later than five days prior to the date fixed for the public opening of sealed bids. These documents will be the basis for determining which bidders are qualified to bid the project. Bidders will be notified by telephone and mail of their prequalification status within four days after submission of prequalification documents. Bids will not be accepted from any bidder who has not been prequalified at least one day prior to the bid opening. Pursuant to Public Contract Code Section 20111.5, the information in the prequalification questionnaire and financial statement will be kept confidential. Prequalification documents may be obtained by contacting the Owner or by downloading them from .

15. Public Contract Code Section 20111.6—Mandatory Prequalification of General Contractors and Mechanical, Electrical and Plumbing Subcontract Bidders.

[check one]

☒ Mandatory Prequalification of general contractors and mechanical, electrical and plumbing subcontractors is not required to bid on this project.

☐ Mandatory Prequalification of general contractors and mechanical, electrical and plumbing subcontractors is required to bid on this project. Prospective bidders holding licenses in classifications A, B, C-4, C-7, C-10, C-16, C-20, C-34, C-36, C-38, C- 42, C- 43 and C- 46 are required to submit to the Owner a completed prequalification questionnaire and financial statement, on forms provided by the Owner, no later than ten (10) working days prior to the date fixed for the public opening of sealed bids. These documents will be the basis for determining which bidders in the listed license categories are qualified to bid the project. Bidders will be notified by telephone, mail or email of their prequalification status within five (5) working days after submission of prequalification documents. Bids will not be accepted from any bidder who is required to prequalify and who has not been prequalified at least five (5) working days prior to the bid opening. Pursuant to Public Contract Code Section 20111.6, the information in the prequalification questionnaire and financial statement will be kept confidential. Prequalification documents may be obtained by contacting the Owner or by downloading them from .

15. Competency of Bidders.

In selecting the lowest responsive and responsible bidder, consideration will be given not only to the financial standing but also to the general competency of the bidder for performance of the work. By submitting a bid, each bidder agrees that in determining the successful bidder and its eligibility for the award, the Owner may consider the bidder's experience, facilities, conduct, and performance under other contracts, financial condition, reputation in the industry, and other factors relating to or which could affect the bidder's performance of the project.

The Owner may also consider the qualifications and experience of subcontractors and other persons and organizations (including those who are to furnish the principal items of material and equipment) proposed for those portions of the work. Operating costs, maintenance considerations, performance data, and guarantees of materials and equipment may also be considered by the Owner. In this regard, the Owner may conduct such investigations as the Owner deems necessary to assist in the evaluation of any bid and to establish the responsibility, qualifications, and financial ability of the bidder, proposed subcontractors, and other persons and organizations to do the work to the Owner's satisfaction within the prescribed time. The Owner reserves the right to reject the bid of any bidder who does not pass any such evaluation to the satisfaction of the Owner, or in the Owner's sole discretion, to permit substitution of subcontractor(s) found non-responsible.

16. Listing Subcontractors.

Each bidder shall submit a list of the proposed subcontractors, including their address, California contractor's license number and DIR Registration number, on the project as required by the Subletting and Subcontracting Fair Practices Act (Public Contract Code Section 4100 and following sections) on the form furnished with the Contract Documents. If alternate bids are called for and the bidder intends to use different or additional subcontractors, a separate list of subcontractors must be submitted for each such alternate bid. The Owner may request that bidder submit information to assess the responsibility of the bidder's proposed subcontractors. The apparent low bidder shall, within 24 hours of the bid opening, provide a complete listing of all subcontractors, including full name, address, telephone numbers, contractor's license number and type and DIR Registration number.

17. Workers' Compensation.

In accordance with the provisions of Labor Code Section 3700, the successful bidder shall secure the payment of compensation to all employees. The successful bidder awarded the contract shall sign and file with the Owner, at the time of returning the executed Construction Agreement, the certificate which is included as a part of the Contract Documents.

18. Contractor's License.

At the bid opening date and time, if a bidder is not properly licensed and registered to perform the project in accordance with Division 3, Chapter 9, of the California Business and Professions Code, Labor Code section 1725.5 and the Notice Calling for Bids, as required, that bidder's bid will be rejected as non-responsive. Business and Professions Code Section 7028.15 precludes payment for work or materials unless the Registrar of Contractors verifies to the Owner that the bidder was properly licensed at the time the bid was submitted. If this project is federally funded, the bidder must be properly licensed prior to the award of the contract. Any bidder not properly licensed and registered with DIR is subject to penalties under the law and the contract can be considered void. If the license classification specified in these Contract Documents is that of a "specialty contractor" as defined in Business and Professions Code Section 7058, the specialty contractor awarded the contract for this work shall construct a majority of the work in accordance with the provisions of Business and Professions Code Section 7059.

19. Anti-Discrimination.

It is the policy of the Owner that in all work performed under contracts there be no unlawful discrimination against any prospective or active employee engaged in the work because of race, color, ancestry, national origin, religious creed, sex, age, marital status, physical disability, mental disability, or medical condition. The successful bidder agrees to comply with applicable federal and state laws, including but not limited to the California Fair Employment and Housing Act, beginning with Government Code Section 12900 and Labor Code Section 1735. In addition, the successful bidder agrees to require like compliance by any subcontractors employed on the work by that bidder.

20. Hold Harmless.

The successful bidder awarded the contract shall hold harmless and indemnify various parties as more clearly set forth elsewhere in the Contract Documents.

21. Substitutions.

(a) All bids should be calculated and submitted on the project as described in the bid documents, and on the assumption that substitution requests submitted with the bid will not be approved. Notwithstanding the foregoing, substitution requests submitted with bids will be given due consideration and adjustments to the contract, which may include adjustment to contract price, will be contained in a change order should the request be approved. Bidders not desiring to bid without prior approval of a proposed substitution should follow the procedure contained in this section for pre-bid review of proposed substitutions.

(b) Should the bidder wish to request prior to bid opening any substitution for the specified materials, process, service, or equipment, the bidder shall submit a written request at least ten (10) working days before the bid opening date and time. If the requested substitution is acceptable, the Owner will approve it in an addendum issued to all bidders of record. Requests received less than ten (10) working days prior to bid opening will not be considered prior to the bid date. Extensions of the bid date shall not operate to extend the deadline for requesting substitutions unless the Owner so states in an addendum issued to all bidders of record.

(c) If a substitution is not requested and considered prior to the bid date, the bidder shall submit with the bid all proposed substitutions, if any, on the Substitution Listing form contained in the bid documents.

(d) With respect to any materials, process, service, or equipment listed in the bid, unless the bidder clearly indicates in its Substitution Listing that it is proposing to use an "equal" material, process, service, or equipment, its bid shall be considered as offering the specified material, process, service, or equipment referred to by the brand name or trade name specified.

(e) Unless expressly authorized in the bid documents, no bid may be conditioned on the Owner's acceptance of a proposed substitution. Any bid containing any such condition may be treated as a non-responsive bid.

(f) It is expressly understood and agreed that the Owner reserves the right to reject any proposed substitution. It is further expressly understood and agreed that in the event the Owner rejects a proposed "equal" item, or any other requested substitution, the specified material, process, service, or equipment designated by brand name or trade name, or other item as specified, will be provided.

(g) No substitution request of any kind or nature may be made after the bid date, except by the express written permission of the Owner and on such terms as Owner may require, or in an emergency, as in the case where a specified material, process, service, equipment, or other item has become unavailable through no fault of the bidder.

(h) These time limitations shall be complied with strictly, and in no case will an extension of time for completion be granted because of the failure to request the substitution of an item at the times and in the manner set forth herein.

(i) Prior to contract award, the Owner shall notify the bidder of the Owner's decision concerning proposed substitutions of "equal" items submitted with the bid. The Owner shall notify bidder of the Owner's decision on any other proposed substitutions as those decisions are made. Notification of all decisions by the

Owner shall be in writing, and no proposed substitution shall be deemed approved unless the Owner has confirmed it in writing.

(j) With respect to all proposed substitutions, the requirements applicable to the Contractor in the Contract Documents shall be applicable to all bidders requesting substitutions.

22. Surety Qualifications.

Bid bonds executed by a surety insurer admitted in the State of California for purposes of issuance of such bonds will be accepted by Owner as sufficient.

Payment and/or performance bonds executed by a surety insurer admitted in the State of California with a minimum "A minus, VIII" rating (A minus V" when the price stated in the Contract Documents is less than $500,000) as rated by the current edition of Best's Key Rating Guide published by A.M. Best Company, Oldwick, New Jersey 08858, shall be presumed by Owner to be sufficient for the issuance of such bonds. In the alternative, any admitted surety company which satisfies the requirements set forth in Code of Civil Procedure Section 995.660 shall be accepted and approved for the issuance of bonds, and documents demonstrating satisfaction of the requirements of Section 995.660 with respect to the bid bond must be submitted with the bid. No personal sureties will be accepted.

23. Liquidated Damages.

All work must be completed within the time limits set forth in the Contract Documents. Bidders must understand that the goodwill, educational process, and other business of the Owner will be damaged if the project is not completed within the time limits required. Should the work not be completed within the specified time for completion, the successful bidder awarded the contract may be liable for liquidated damages and for expenses incurred by the Owner for failure to timely complete the project. Such damages shall be deducted from any payments due or to become due to the successful bidder.

SUBMISSION OF A BID ON THIS PROJECT SHALL BE TAKEN AS CONCLUSIVE AND IRREFUTABLE EVIDENCE THAT BIDDER AGREES WITH THE REQUIREMENTS OF THIS SECTION.

24. Drug-Free Workplace Certification.

Pursuant to Government Code section 8350 and following, the successful bidder will be required to execute and return to Owner the Drug-Free Workplace Certificate contained in the Contract Documents with the executed Construction Agreement. The bidder will be required to take positive measures outlined in the certificate to ensure the presence of a drug-free workplace. Failure to abide with the conditions set forth in the Drug-Free Workplace Act could result in penalties, including termination of the Construction

Agreement or suspension of payment under the Construction Agreement.

25. Non-Collusion Declaration.

In accordance with the provisions of Public Contract Code section 7106, each bid must be accompanied by a Non-Collusion Declaration executed under penalty of perjury under the laws of the State of California.

26. Implementation of Disabled Veteran Business Enterprises Requirements.

In accordance with Education Code Section 17076.11, the Owner has a participation goal for disabled veteran business enterprises of at least three percent per year of the overall dollar amount of funds allocated to the Owner by the State Allocation Board pursuant to the Leroy F. Greene School Facilities Act of 1998 for construction or modernization and expended each year by the Owner. Prior to and as a condition precedent for final payment under any contract for this project, the successful bidder will be required to provide appropriate documentation to the Owner identifying the amount paid to disabled veteran business enterprises in conjunction with the contract, so the Owner can assess its success at meeting this goal.

27. Asbestos and Lead-Based Paint Certification.

The form of Contractor's Certificate Regarding Non-Asbestos Containing Materials and Exclusion of Lead Products, as contained in the Contract Documents, shall be executed and submitted with the bid.

28. Fingerprinting Requirements.

The successful bidder and all subcontractors at any level will be required to comply with any applicable laws on fingerprinting construction workers. Minimum requirements are set forth in the Contract Documents, and the form for certification of compliance is contained in the Contract Documents. The successful bidder must complete and return this form when directed by Owner.

29. California Products.

Price, fitness, and quality being equal with regard to supplies, the Owner may prefer supplies grown, manufactured, or produced in California. The Owner may next prefer supplies partially grown, manufactured, or produced in California. Where the Owner has a preference, the bids of the suppliers or the prices quoted by them (i) must not exceed by more than five percent the lowest bids/prices quoted by out-of-state suppliers, (ii) the major portion of the manufacture of the supplies is not done outside of California, and (iii) the public good will be served. Refer to specifications for indications of Owner preferences. Government Code Sections 4330-4334.

30. Contractor License And DIR Registration Required.

To perform the work required for this project, Bidder must possess the type of contractor's license specified in the Notice to Contractors Calling for Bids, and must be registered with the Department of Industrial Relations (DIR) as a public works contractor. Contractor registration can be accomplished through the portal https://efiling.dir.ca.gov/PWCR/. No CONTRACTOR or subcontractor shall be qualified to bid on, be listed in a bid proposal, subject to the requirements of § 4104 of the Public Contract Code, for a public works project (submitted on or after March 1, 2015) unless currently registered with the DIR and qualified to perform public work pursuant to Labor Code § 1725.5. No CONTRACTOR or subcontractor may be awarded a contract for public work on a public works project (awarded after April 1, 2015) unless registered with the DIR.

31. Post-Bid Credits.

Should any bidder or proposed subcontractor to any bidder issue any credit or otherwise reduce its bid or quote pertaining to the work of this project, the value of the credit or other reduction shall be passed on to the Owner less only the applicable markups for profit and overhead as specified in the Contract Documents on change orders.

32. Contents of Bid.

The bid will include the following documents: Bid Form, List of Subcontractors, Substitution Listing form, Non-collusion Declaration, Exclusion of Asbestos and Lead Based Paint Products Certification, Contractors' Qualification Questionnaire (if required) Mandatory Prequalification Package (if required), Iran Contracting Act Certification (if required), Bid Bond or other bid security, and Certification of Attendance at Mandatory Job Walk, if a job walk is required on this project.

33. Bid Protests.

Any bidder having submitted a bid on the project may file a protest against the proposed contract award or challenging the validity of other bids. The protest must meet all the following requirements:

(a) The protest shall be submitted in writing and shall contain all the materials required by these provisions; one that does not contain all the required material shall not be recognized.

(b) The protest shall be received by the Owner no later than close of business on the second business day after bid opening; one received after that time shall not be recognized.

(c) Each protest shall contain the following:

(i) Identification by name, address, and telephone number of the protesting person(s), company and/or organization and identification of the project to which the protest pertains.

(ii) The protest shall set forth in detail all grounds for the protest, including without limitation all facts, identification by name of any other bids or bidders involved in the protest, all supporting documentation, together with any legal authorities and/or argument in support of the grounds for the protest. Any matters not set forth in the written protest shall be deemed waived. All factual contentions must be supported by competent, admissible, and credible evidence.

(d) Any protest not conforming to the requirements of this section shall be rejected as invalid.

(e) Where a protest is filed in conformity with this section, the Owner's staff, or such individual(s) as may be designated by the Owner, shall review and evaluate the basis of the protest and provide a written decision to the protesting bidder. The written decision shall either concur with or deny the protest.

(f) Submission of a written protest to and receipt of a written decision from the Owner staff shall be considered an administrative remedy, and failure to follow this procedure shall be a bar to any legal action.

(g) The written decision by the Owner's staff is not subject to arbitration, mediation, reconsideration, or further appeal. Any protest not involving a finding of non-responsibility shall be fully and finally decided by Owner's staff, and there shall be no right for a protesting bidder to appeal Owner's staff's written decision to the Owner's governing board unless such appeal concerns a finding on non-responsibility.

34. Procedure for Protesting Being Deemed a Non-Responsible Bidder.

Any bidder or prospective bidder deemed non-responsible after having submitted a bid may file an appeal of the action to the Owner's governing board or other governing body. The protest must meet all the following requirements:

(a) The appeal shall be submitted in writing, and shall contain all the materials required by these provisions; one that does not contain all the required material shall not be recognized.

(b) The appeal must be received by the Owner's governing board or other governing body within two business days of the action by Owner giving rise to the protest; one received after that time shall not be recognized.

(c) A hearing on the appeal shall be held before the Owner's governing board or other governing body prior to the award of contract.

(d) The decision of the Owner's governing board or other governing body is not subject to arbitration, mediation, reconsideration, or further appeal.

(e) Submission of a protest to and receipt of a decision from the Owner's governing board or other governing body shall be considered an administrative remedy, and failure to follow this procedure shall be a bar to any legal action.

35. All Projects Over $1,000 Are Subject to Prevailing Wage Monitoring and Enforcement by the Labor Commissioner

The project is subject to prevailing wage monitoring and enforcement by the DIR, as indicated in the Notice Calling for Bids. The successful bidder and all subcontractors will be subject to the requirements of Subchapter 4.5 of Chapter 8 of Title 8 of the California Code of Regulations. The successful bidder and all subcontractors will be required to furnish certified payroll records to the Labor Commissioner on the frequency specified in the Notice Calling for Bids using the DIR's eCPR system. To access the DIR's eCPR system and to obtain additional information and assistance, bidders may go to DIR website www.dir.ca.gov/Public-Works/Certified-Payroll-Reporting.html. Failure to timely submit certified payroll records may result in debarment from public works projects by the Labor Commissioner for a period of one to three years.

03-BID FORM

Name of Bidder:

Project: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)

Project #:

To: KERN COMMUNITY COLLEGE DISTRICT, referred to as "OWNER."

A. In compliance with your Notice to Contractors Calling for Bids and related documents, the undersigned bidder, having familiarized itself with the terms of the contract, the local conditions affecting the performance of the contract, the cost of the work at the place where the work is to be done, and the drawings and specifications and other contract documents, proposes and agrees to perform the contract within the time stipulated, including all of its component parts and everything required to be performed, and to provide and furnish any and all of the labor, materials, tools, expendable equipment, and all applicable taxes, utility, and transportation services necessary to perform the contract and complete in a workmanlike manner all of the work required in connection with the above-referenced project, including sheeting, shoring, and bracing, or equivalent method for protection of life and limb in trenches and open excavation in conformance with applicable safety orders, within the time limits set for completion of all work, all in strict conformity with the drawings and specifications and other contract documents, including Addenda Nos. on file at the office of OWNER for the Base Bid sum of:
[list all]

dollars.
[written in words]

$.
[written in numbers]

B. The Bidder agrees that upon written notice of acceptance of this bid, he will execute the contract and provide all bonds and other required documents within ten (10) working days after contract award.

C. Attached is bid security not less than 10 percent of the bid, in the amount of $, in the form of ☐(cash) ☐(bid bond) ☐(certified check) ☐(cashier's check).
[check one]

D. The Bidder acknowledges that OWNER reserves the right to accept or reject any and/or all Base Bids and alternate bids. This entire bid shall remain open and active for sixty (60) days after bid opening, and any alternate bids not initially awarded shall remain active, as an irrevocable offer by the Bidder to enter into either a change order or separate contract, for up to six months after award of the contract.

E. It is understood and agreed that if written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the Bidder after the opening of the bid, and within the time this bid is required to remain open, or at any time after that before this bid is withdrawn, the Bidder will execute and deliver to OWNER the Agreement and will also furnish and deliver to OWNER the Performance Bond and a separate Payment Bond as specified, certificates of insurance, and other required documents.

F. It is understood and agreed that should the Bidder fail or refuse to return executed copies of the Construction Agreement, bonds, insurance certificates, and other required documents to OWNER within the time specified, the bid security shall be forfeited to OWNER.

G. In submitting this bid, the Bidder offers and agrees that if the bid is accepted it will assign to OWNER all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Section 15) or under the Cartwright Act (Business & Professions Code Section 16700 and following sections) arising from purchases of goods, materials, or services by the Bidder for sale to OWNER pursuant to the bid. Such assignment shall be made and become effective at the time OWNER tenders final payment under the contract. (Public Contract Code Section 7103.5; Government Code Section 4552.)

H. The Bidder hereby certifies that it is, and at all times during the performance of work under the Contract Documents shall be, in full compliance with the provisions of the Immigration Reform and Control Act of 1986 ("IRCA") in the hiring of its employees, and the Bidder shall indemnify, hold harmless, and defend OWNER against any and all actions, proceedings, penalties, or claims arising out of the Bidder's failure to comply strictly with the IRCA.

I. The Bidder understands that a licensed contractor shall not submit a bid to a public agency unless the Bidder’s contractor’s license number appears clearly on the bid, the license expiration date is stated, and the bid contains a statement that the representations made therein are made under penalty of perjury. Any bid not containing this information, or a bid containing information which is subsequently proven false, may be considered non-responsive and may be rejected by the public agency.

J. Bidder's contractor's license is:

[number] *[class]* *[expires]*

[DIR registration number] *[expires]*

K. Attached is Bidder's AB 1565 Prequalification Questionnaire Validation Form (if required by the Notice to Contractors Calling for Bids, paragraph 20, and the Instructions to Bidders, paragraph 36).

L. The undersigned hereby declares that all of the representations of this bid, including all documents comprising the bid package, are true and are made under penalty of the perjury laws of the State of California.

INDIVIDUAL/DBA

*Signature: _____

Print Name:

Business Address:

Date: Telephone:

PARTNERSHIP

Partnership Name:
*By: _____, Partner

Print Name:

Business Address:

Date: Telephone:

Names of Other Partners:

CORPORATION

Corporation Name: , a Corporation.
(State of Incorporation)

Business Address:

Date: Telephone:

*By: _____ *[Required]* ***[Seal]***
(President/Chief Executive Officer/Vice President) *[Circle One]*

Print Name:

*By: _____ *[Required]*
(Secretary/Treasurer/Chief Financial Officer/Assistant Treasurer) *[Circle One]*

Print Name:

JOINT VENTURE

Joint Venturer Name:

*Signed by: _____ (Joint Venturer)

Print Name:

Business Address:

Date: Telephone:

Other Parties to Joint Venture:

If an individual joint venturer:

*By: _____ (Signature)
Print Name:

If a DBA joint venturer:

*By: _____ (Signature)
Print Name:

If a partnership joint venturer:
*By: _____ (Signature)
Print Name:

If a Corporation joint venturer: ***[Seal]***

,
(Name)
a Corporation.
(State of Incorporation)

*By: _____

Print Name:

Title:

***Important Notice**: Labor Code § 1771.1(a) provides that "A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Labor Code Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded." Please go to http://www.dir.ca.gov/Public-Works/PublicWorks.html for more information and to register. This project is subject to monitoring by the Department of Industrial Relations.

04-SUBSTITUTION LISTING

****TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID****

TO: KERN COMMUNITY COLLEGE DISTRICT ("OWNER")

1. Pursuant to bidding and contract requirements for the work titled:
   Project Title/Bid #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)

The contract sum, proposed by the undersigned on the Bid Form, is for the work as shown on the drawings, described in the specifications, and otherwise defined in the Contract Documents. However, the undersigned proposes the following substitutions for the Owner's consideration. Should the Owner accept any or all of the proposed substitutions, the Bidder agrees to reduce the contract sum by the amount shown. Proposed substitutions must be submitted not later than 10 working days prior to the date of bid opening in order for such request to be reviewed before bidding. All substitutions must be listed on this form and submitted prior to or with the bid or they will not be reviewed.

2. Please complete, attaching additional sheets as necessary:

Bidder proposes [check one]: ☐ no substitutions.
☐ the following substitutions:

Specified Product or Material	Drawing Number or Specification Section	Proposed Substitution	Proposed Price Reduction

3. All bids should be calculated and submitted on the assumption that substitution requests will not be approved.

4. Bidder hereby certifies that the requested substitutions are equal or better in all respects to what is specified, unless otherwise noted.

SIGNATURE MUST BE IDENTICAL TO THAT PROVIDED ON BID FORM

BIDDER:

By: _____

Print Name:

05-LIST OF SUBCONTRACTORS

TO BE SUBMITTED WITH BID

PROJECT TITLE: BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

A. In compliance with the Subletting and Subcontracting Fair Practices Act (Public Contract Code Section 4100 and following sections) and any amendments to the Act, each Bidder shall set forth below:

1. The name, location of the place of business California contractor license number and DIR registration number of:

   a. Each subcontractor who will perform work or labor or render service to the Bidder in or about the construction of the work or improvement to be performed under the Construction Agreement;

   b. Each subcontractor licensed by the State of California who, under subcontract to the Bidder, specially fabricates and/or 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 one percent of the Bidder's total bid or Ten Thousand Dollars ($10,000), whichever is greater;

2. The portion of the work which will be done by each subcontractor.

B. The Bidder shall list only one subcontractor for each such portion as is defined by the Bidder in this bid.

C. If the Bidder fails to specify a subcontractor, or if the Bidder specifies more than one subcontractor for the same portion of work to be performed under the contract in excess of one-half of one percent of the Bidder's total bid, the Bidder shall be deemed to have agreed that the Bidder is fully qualified to perform that portion, and that the Bidder alone shall perform that portion.

D. No Bidder whose bid is accepted shall (i) substitute any subcontractor, (ii) permit any subcontractor to be voluntarily assigned or transferred, or allow it to be performed by anyone other than the original subcontractor listed in the original bid, or (c) sublet or subcontract any portion of the work in excess of one-half of one percent of the Bidder's total bid as to which the original bid did not designate a subcontractor, except as authorized in the Subletting and Subcontracting Fair Practices Act.

E. Violations of any provision of the Subletting and Subcontracting Fair Practices Act may be deemed by the OWNER to make the bid non-responsive and/or the Bidder non-responsible.

F. Attach additional sheets, as necessary.

SUBCONTRACTOR'S NAME & LOCATION	DESCRIPTION OF PORTION TO BE SUBCONTRACTED	CALIFORNIA CONTRACTOR LICENSE NO.	DIR REGISTRATION NUMBER

LIST OF SUBCONTRACTORS

Firm Name:

By: _____
[Signature must match that on bid]

Print Name:

06-BID BOND

IF USED BY BIDDER, MUST BE COMPLETED AND SUBMITTED WITH BID

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

KNOW ALL MEN BY THESE PRESENTS, that we, as Principal, and as Surety, are held and firmly bound unto the (referred to as Owner) in the sum of percent of the total amount of the bid of the Principal submitted to the Owner for the work and obligations described below for the payment of which sum in lawful money of the United States, well and truly to be made, we jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of this obligation is such that whereas the Principal has submitted the accompanying bid dated , 20 , for: $.

NOW, THEREFORE, if the Principal shall not withdraw said bid within the period specified therein after the opening of the same, or if no period be specified, within 60 days after said opening; and if the Principal is awarded the contract, and shall within the specified period, or if no period is specified, within five working days after the award of the contract, enter into a written contract with the Owner in accordance with the bid as accepted and give bonds with good and sufficient surety or sureties as may be required for the faithful performance and proper fulfillment of such contract and for the payment of labor and materials used for the performance of the contract, provide certificates evidencing the required insurance is in effect (in the amounts required in the contract documents), and provide any other documents required under the contract documents to be submitted at the time the contract is executed, then the above obligation shall be void and of no effect, otherwise to remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or the call for bids, or to the work to be performed thereunder, or the specifications accompanying the same, shall in any way affect its obligation under this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of said contract or the call for bids, or to the work, or to the specifications.

In the event suit is brought upon this bond by the Owner and judgment is recovered, the Surety shall pay all costs incurred by the Owner in such suit, including a reasonable attorney's fee to be fixed by the court.

IN WITNESS WHEREOF, the parties have executed this instrument under their several seals this day of , 20 , the name and corporate party being hereto affixed and duly signed by its undersigned authorized representative.

DATED:

PRINCIPAL

By: _____

Title:

DATED:

SURETY

By: _____

Title:

Note: Signatures of those executing for the Surety must be properly acknowledged.

07-NONCOLLUSION DECLARATION
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)

OWNER: KERN COMMUNITY COLLEGE DISTRICT

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].

Contractor:

By_____

Title:
Signature:_____

08-EXCLUSION OF LEAD AND ASBESTOS PRODUCTS

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

Pursuant to the provisions of the California Education Code for construction, modernization, or renovation of school facilities, lead based paint, lead plumbing, and solders, or other potential sources of lead contamination shall not be utilized in the construction of any new school facility or the modernization or renovation of any existing school facility.

The Contractor agrees that sources and potential sources of lead contamination, whether in products or materials, will not be used in performing work under the Agreement.

In addition, the Contractor agrees that asbestos containing products or materials will not be used in performing work under the Agreement.

At completion of work under the Agreement, the Contractor will warrant and represent to the Owner the following:

1. That no asbestos containing products or materials, or sources or potential sources of lead contamination, were used in performing work under the Agreement.

2. That should any asbestos containing products, or sources or potential sources of lead contamination, be found to have been used by the Contractor or any subcontractor, supplier, or vendor on the Project, the Contractor will replace them, together with all related materials, at no cost to the Owner.

3. That should the replacement require any interruption in the normal operation of the school, the Contractor will pay all costs necessarily incurred to keep the school functioning with the least possible disruption to its day-to-day operations.

Executed at , California, on , 20 .

Firm Name:

By:
Title:
Signed: _____
[Signature must match that on bid]

09-CONSTRUCTION AGREEMENT

THIS AGREEMENT, dated , in the County of , State of California, is by and between the KERN COMMUNITY COLLEGE DISTRICT ("OWNER") and ("CONTRACTOR").

For the consideration stated in this Agreement, OWNER and CONTRACTOR agree as follows:

1. Contract Documents. The complete Agreement includes all of the Contract Documents as defined in the General Conditions and any other documents comprising any portion of the bid package, and all modifications, addenda, and amendments of or to any of these documents, all of which are incorporated by reference into this Agreement. The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all.

2. Scope of Performance. CONTRACTOR shall perform within the time set forth in Paragraph 4 of this Agreement everything required to be performed, and shall provide and furnish all labor, materials, necessary tools, expendable equipment, and all utility and transportation services described in the Contract Documents and required for construction of .

All of the work to be performed and materials to be furnished shall be completed in a good workmanlike manner in strict accordance with the Plans, Drawings, Specifications and all provisions of the Contract Documents as defined above. CONTRACTOR shall be liable to OWNER for any damages arising as a result of a failure to fully comply with this obligation, and CONTRACTOR shall not be excused with respect to any failure to so comply by any act or omission of OWNER, the Architect, Engineer, Inspector, Division of State Architect, or representative of any of them, unless such act or omission actually prevents CONTRACTOR from fully complying with the requirements of the Contract Documents, and unless CONTRACTOR protests at the time of the alleged prevention that the act or omission is preventing CONTRACTOR from fully complying with the Contract Documents. The protest shall not be effective unless reduced to writing and filed with OWNER within three working days of the date of occurrence of the act or omission preventing CONTRACTOR from fully complying with the Contract Documents.

3. Contract Price. Subject to any additions or deductions as provided in the Contract Documents, as full consideration for the faithful performance of the contract OWNER shall pay to CONTRACTOR the sum of $.

4. Construction Period. The work shall be commenced on or before the 5th day after receiving OWNER's Notice to Proceed and shall be completed within 271 consecutive calendar days from the date specified in the Notice to Proceed.

5. Liquidated and Other Damages. All work must be completed within the time limits set forth in the Contract Documents. If the work is not completed in accordance with the time limits set forth in this Agreement, in accordance with Government Code Section 53069.85, CONTRACTOR shall pay to OWNER as fixed and liquidated damages, and not as a penalty, the sum of $250 for each calendar day of delay until work is completed and accepted.

Detailed requirements concerning liquidated damages and other damages which may be assessed if CONTRACTOR fails to complete the project within the time period provided in this Agreement are contained in the General Conditions.

6. Insurance. Prior to commencing the work, CONTRACTOR shall take out and maintain during the life of this contract, and shall require all subcontractors, if any, whether primary or secondary, to take out and maintain all insurance as required in the General Conditions.

7. Substitution of Securities. Public Contract Code Section 22300 permits the substitution of securities for any monies withheld by a public agency to ensure performance under a contract. At the request and expense of CONTRACTOR, securities equivalent to the amount withheld shall be deposited with the public agency, or with a state or federally chartered bank in California as the escrow agent, who shall then pay such monies to CONTRACTOR. OWNER retains the sole discretion to approve the bank selected by CONTRACTOR to serve as escrow agent. Upon satisfactory completion of the contract, the securities shall be returned to CONTRACTOR. Securities eligible for investment shall include those listed in Government Code Section 16430 or bank or savings and loan certificates of deposit. CONTRACTOR shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest thereon.

In the alternative, under Section 22300, CONTRACTOR may request OWNER to make payment of earned retentions directly to the escrow agent at the expense of CONTRACTOR. Also at CONTRACTOR's expense, CONTRACTOR may direct investment of the payments in securities, and CONTRACTOR shall receive interest earned on such investment upon the same conditions as provided for securities deposited by CONTRACTOR. Upon satisfactory completion of the contract, CONTRACTOR shall receive from the escrow agent all securities, interest, and payments received by escrow agent from OWNER pursuant to the terms of Section 22300. Not later than 20 days after receipt of such payment, CONTRACTOR shall pay to each subcontractor the respective amount of interest earned, net of costs attributed to retention withheld from each subcontractor, on the amount of retention withheld to ensure performance of CONTRACTOR.

8. Corporate Status and Authorization. If CONTRACTOR is a corporation, the undersigned hereby represents and warrants that the corporation is duly incorporated and in good standing in the State of California, and that , whose title is , is authorized to act for and bind the corporation.

9. Posting. Contractor shall be responsible to post job site notices prescribed by Title 8 CCR § 16451 (d) pertaining to prevailing wage monitoring by the Department of Industrial Relations.

10. Entire Agreement. This Agreement, including the Contract Documents incorporated by reference, constitutes the final, complete, and exclusive statement of the terms of the agreement between the parties pertaining to construction of the project. It supersedes all prior and contemporaneous understandings or agreements of the parties. No party has been induced to enter into this Agreement by, nor is any party relying on, any representation or warranty outside those expressly set forth in this Agreement. The Agreement can only be modified by an amendment in writing, signed by both parties and approved by action of OWNER's governing board or other governing body.

11. Parties in Interest. Nothing in this Agreement, whether express or implied, is intended to confer any rights or remedies under or by reason of this Agreement on any person other than the parties to this Agreement and their respective successors and assigns. Nothing in this Agreement, whether express or implied, is intended to relieve or discharge the obligation or liability of any third person to any party to this Agreement, nor shall any provision give any third person any right of subrogation or action against any party to this Agreement.

12. Severability. If any provision of this Agreement is held by a court of competent jurisdiction to be invalid or unenforceable, the remainder of the Agreement shall continue in full force and effect and shall in no way be impaired or invalidated.

13. Governing Law. The rights and obligations of the parties and the interpretation and performance of this Agreement shall be governed by the laws of California, excluding its conflict of laws rules.

The parties have executed this Agreement by the signatures of their authorized representatives effective the date indicated above.

DISTRICT	CONTRACTOR
By: _____ Signature	*By: _____ Signature
Print Name Above	Print Name Above
Print Title Above	Print Title Above

[Continued on Following Page]

[CORPORATE SEAL OF CONTRACTOR, if a corporation]

Contractor's License No.

Tax ID/Social Security No.

DIR Registration No.

***Important Notice**: Labor Code § 1771.1(a) provides that "A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Labor Code Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded." Please go to http://www.dir.ca.gov/Public-Works/PublicWorks.html for more information and to register. This project is subject to monitoring by the Department of Industrial Relations.

09-CONSTRUCTION AGREEMENT

THIS AGREEMENT, dated , in the County of , State of California, is by and between the KERN COMMUNITY COLLEGE DISTRICT ("OWNER") and ("CONTRACTOR").

For the consideration stated in this Agreement, OWNER and CONTRACTOR agree as follows:

1. Contract Documents. The complete Agreement includes all of the Contract Documents as defined in the General Conditions and any other documents comprising any portion of the bid package, and all modifications, addenda, and amendments of or to any of these documents, all of which are incorporated by reference into this Agreement. The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all.

2. Scope of Performance. CONTRACTOR shall perform within the time set forth in Paragraph 4 of this Agreement everything required to be performed, and shall provide and furnish all labor, materials, necessary tools, expendable equipment, and all utility and transportation services described in the Contract Documents and required for construction of .

All of the work to be performed and materials to be furnished shall be completed in a good workmanlike manner in strict accordance with the Plans, Drawings, Specifications and all provisions of the Contract Documents as defined above. CONTRACTOR shall be liable to OWNER for any damages arising as a result of a failure to fully comply with this obligation, and CONTRACTOR shall not be excused with respect to any failure to so comply by any act or omission of OWNER, the Architect, Engineer, Inspector, Division of State Architect, or representative of any of them, unless such act or omission actually prevents CONTRACTOR from fully complying with the requirements of the Contract Documents, and unless CONTRACTOR protests at the time of the alleged prevention that the act or omission is preventing CONTRACTOR from fully complying with the Contract Documents. The protest shall not be effective unless reduced to writing and filed with OWNER within three working days of the date of occurrence of the act or omission preventing CONTRACTOR from fully complying with the Contract Documents.

3. Contract Price. Subject to any additions or deductions as provided in the Contract Documents, as full consideration for the faithful performance of the contract OWNER shall pay to CONTRACTOR the sum of $.

4. Construction Period. The work shall be commenced on or before the 5th day after receiving OWNER's Notice to Proceed and shall be completed within 100 consecutive calendar days from the date specified in the Notice to Proceed.

5. Liquidated and Other Damages. All work must be completed within the time limits set forth in the Contract Documents. If the work is not completed in accordance with the time limits set forth in this Agreement, in accordance with Government Code Section 53069.85, CONTRACTOR shall pay to OWNER as fixed and liquidated damages, and not as a penalty, the sum of $250 for each calendar day of delay until work is completed and accepted.

Detailed requirements concerning liquidated damages and other damages which may be assessed if CONTRACTOR fails to complete the project within the time period provided in this Agreement are contained in the General Conditions.

6. Insurance. Prior to commencing the work, CONTRACTOR shall take out and maintain during the life of this contract, and shall require all subcontractors, if any, whether primary or secondary, to take out and maintain all insurance as required in the General Conditions.

7. Substitution of Securities. Public Contract Code Section 22300 permits the substitution of securities for any monies withheld by a public agency to ensure performance under a contract. At the request and expense of CONTRACTOR, securities equivalent to the amount withheld shall be deposited with the public agency, or with a state or federally chartered bank in California as the escrow agent, who shall then pay such monies to CONTRACTOR. OWNER retains the sole discretion to approve the bank selected by CONTRACTOR to serve as escrow agent. Upon satisfactory completion of the contract, the securities shall be returned to CONTRACTOR. Securities eligible for investment shall include those listed in Government Code Section 16430 or bank or savings and loan certificates of deposit. CONTRACTOR shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest thereon.

In the alternative, under Section 22300, CONTRACTOR may request OWNER to make payment of earned retentions directly to the escrow agent at the expense of CONTRACTOR. Also at CONTRACTOR's expense, CONTRACTOR may direct investment of the payments in securities, and CONTRACTOR shall receive interest earned on such investment upon the same conditions as provided for securities deposited by CONTRACTOR. Upon satisfactory completion of the contract, CONTRACTOR shall receive from the escrow agent all securities, interest, and payments received by escrow agent from OWNER pursuant to the terms of Section 22300. Not later than 20 days after receipt of such payment, CONTRACTOR shall pay to each subcontractor the respective amount of interest earned, net of costs attributed to retention withheld from each subcontractor, on the amount of retention withheld to ensure performance of CONTRACTOR.

8. Corporate Status and Authorization. If CONTRACTOR is a corporation, the undersigned hereby represents and warrants that the corporation is duly incorporated and in good standing in the State of California, and that , whose title is , is authorized to act for and bind the corporation.

9. Posting. Contractor shall be responsible to post job site notices prescribed by Title 8 CCR § 16451 (d) pertaining to prevailing wage monitoring by the Department of Industrial Relations.

10. Entire Agreement. This Agreement, including the Contract Documents incorporated by reference, constitutes the final, complete, and exclusive statement of the terms of the agreement between the parties pertaining to construction of the project. It supersedes all prior and contemporaneous understandings or agreements of the parties. No party has been induced to enter into this Agreement by, nor is any party relying on, any representation or warranty outside those expressly set forth in this Agreement. The Agreement can only be modified by an amendment in writing, signed by both parties and approved by action of OWNER's governing board or other governing body.

11. Parties in Interest. Nothing in this Agreement, whether express or implied, is intended to confer any rights or remedies under or by reason of this Agreement on any person other than the parties to this Agreement and their respective successors and assigns. Nothing in this Agreement, whether express or implied, is intended to relieve or discharge the obligation or liability of any third person to any party to this Agreement, nor shall any provision give any third person any right of subrogation or action against any party to this Agreement.

12. Severability. If any provision of this Agreement is held by a court of competent jurisdiction to be invalid or unenforceable, the remainder of the Agreement shall continue in full force and effect and shall in no way be impaired or invalidated.

13. Governing Law. The rights and obligations of the parties and the interpretation and performance of this Agreement shall be governed by the laws of California, excluding its conflict of laws rules.

The parties have executed this Agreement by the signatures of their authorized representatives effective the date indicated above.

DISTRICT	CONTRACTOR
By: _____ Signature	*By: _____ Signature
Print Name Above	Print Name Above
Print Title Above	Print Title Above

[Continued on Following Page]

[CORPORATE SEAL OF CONTRACTOR, if a corporation]

Contractor's License No.

Tax ID/Social Security No.

DIR Registration No.

***Important Notice**: Labor Code § 1771.1(a) provides that "A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Labor Code Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded." Please go to http://www.dir.ca.gov/Public-Works/PublicWorks.html for more information and to register. This project is subject to monitoring by the Department of Industrial Relations.

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10-GENERAL CONDITIONS-GC

PROJECT TITLE/ BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

ARTICLE 1 DEFINITIONS

A. Action of the Governing Board or Other Governing Body: An official act of the governing board or other governing body of OWNER.

B. Approve: The term "approve," where used in conjunction with the Architect's action on the CONTRACTOR'S submittals, applications, and request, is limited to the responsibilities and duties of the Architect stated in General and Supplementary Conditions. Approval shall not release CONTRACTOR from responsibility to fulfill Contract Document requirements, unless otherwise provided in the Contract Documents.

C. Architect: The person, persons, or entity selected by OWNER to provide architectural services to the Project. Architect is an independent contractor and is not an agent of OWNER.

D. Contract Documents: All contract documents, including all official documents on this Project, including the Notice Calling for Bids, Instructions to Bidders, Bid Form, Designation of Subcontractors, Workers' Compensation Certificate, Performance Bond, Payment Bond, Change Orders, Shop Drawings and their Transmittals, Information Required of Bidder, all prequalification forms submitted pursuant to Public Contract Code sections 20111.5 or 20111.6, if any, Substitution Listing form on any approved substitutions, Non-Collusion Declaration, Insurance Certificates, Guarantees, Contractor's Certificate Regarding Non-Asbestos and/or Lead Containing Materials, if any, Davis-Bacon Compliance Certification, Fingerprinting Certifications, Labor Compliance Program documents, General Conditions, Supplemental General Conditions, if any, Iran Contracting Act Certification, if any, Special Conditions and/or Requirements, if any, Plans, Drawings, Specifications, the Construction Agreement, and all Modifications, addenda, and amendments of those documents.

E. Modification:

1. A written amendment to the Contract Documents signed by both parties;

2. A fully executed Change Order;

3. A written interpretation issued by the Architect; or

4. A written order for a minor change in the Work issued by the Architect.

F. CONTRACTOR: That entity awarded this Construction Agreement by official action of OWNER. Throughout the Contract Documents CONTRACTOR is treated as being of singular number and neuter gender.

G. Date of Acceptance: The date when all of the following conditions are satisfied:

1. OWNER is able to occupy all portions of the project.

2. The notice of completion is recorded with local authorities.

3. The final verified report is filed with the Division of State Architect of the Department of General Services.

4. Acceptance of project by OWNER's governing board or other governing body.

H. Days: Calendar days unless noted otherwise.

I. Equivalent to: Equal or superior in function and quality and approved by the Architect.

J. Furnish: Means “supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations.”

K. Indicated: Refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as “shown,” “noted,” or “scheduled” are used, it is to help locate the reference; no limitation on locations is intended except as specifically noted.

L. Install: Used to describe operations at the project site, including the actual “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protection, cleaning and similar operations.”

M. Installer: An entity engaged by CONTRACTOR, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar required operations. Installers are required to be experienced in the operations they are engaged to perform and licensed as required in the individual specification sections.

N. Liquidated Damages: Pursuant to Government Code Section 53069.85, this is the specified sum of money that CONTRACTOR shall forfeit and pay to OWNER for

those specified portions of the Project that are uncompleted and delayed beyond the stated completion time.

O. Or Equal: Where named products in specification text are accompanied or are deemed by law to be followed by the term “or equal,” or other language of similar effect, CONTRACTOR shall comply with those Contract Document provisions for ”substitutions” when obtaining Architect’s review and consideration.

P. OWNER: The school district, community college district, County Superintendent of Schools, or other public entity executing the Construction Agreement acting through its governing board or other governing body.

Q. Plans: The reproductions of the official drawings adopted and approved by OWNER showing locations, character, dimensions, and details of the work.

R. Project: The undertaking planned by OWNER and CONTRACTOR as provided in the Contract Documents.

S. Project Inspector/Inspector of Record: Any individual or firm retained by OWNER as the on-site inspector for a particular project hired by and paid by OWNER and under general direction of the Architect or registered engineer in charge. The Project Inspector shall be responsible for inspecting all work included in the Contract Documents. A special inspector shall be responsible only for inspecting the work for which he/she is approved. Inspectors are independent contractors and are not agents or employees of OWNER.

T. Project Manual: The volume(s) that include the bidding requirements, sample forms, and all of the initial Contract Documents, such as Conditions of the Contract, Schedules and Details Manual, the Specifications, and the addenda to be used on the Project.

U. Project Site: The space available to CONTRACTOR for performance of the Work, either exclusively or in conjunction with others performing other construction as part of the Project. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land upon which the Project is to be built.

V. Provide: Includes “provide complete in place,” that is, furnish and install.

W. Refer: Indicates that the subject is defined or specified in further detail at another location in the Contract Documents or elsewhere as indicated. Except, as otherwise noted, “refer” does not imply that CONTRACTOR must purchase or subcontract the subject work in any special manner.

X. Related Work in Other Sections: A nonrestrictive term used throughout the Specifications to coordinate the Work and facilitate checking and bidding.

Y. Required: As required by Contract Documents.

Z. Safety Orders: Issued by Division of Industrial Safety and OSHA Safety and Health Standards for Construction.

AA. Specification: The printed instruction and requirements which complement the plans as to the methods and manner of performing the Work or to the quantities and qualities of the materials to be furnished.

BB. Subcontractor: Includes those having a direct contract with the CONTRACTOR and those who furnish material worked to a special design according to plans, drawings, and Specifications of this work, but does not include those who merely furnish material not so worked.

CC. Surety: The firm or corporation executing CONTRACTOR'S Performance Bond and/or Payment Bond as surety, as the context indicates.

DD. Testing Laboratory: An independent entity engaged to perform specific inspections or test, either at the Project Site or elsewhere, and to report on, and if required, interpret results of those inspections or tests. It is not an agent of OWNER.

EE. Unfinished: Refers to the status of the Work prior to reaching completion, as described in Article 61.

FF. Work: Work of the CONTRACTOR and subcontractors, including all labor or materials (including without limitation, equipment, and appliances), both incorporated in, or to be incorporated in the Project in order to fully meet the requirements of the Contract Documents.

ARTICLE 2 STATUS OF CONTRACTOR

A. CONTRACTOR is and shall at all times be deemed to be an independent contractor and shall be wholly responsible for the manner in which it performs the services required of it by the terms of the Contract Documents.

B. Nothing contained in the Contract Documents shall be construed as creating the relationship of employer and employee, or principal and agent, between OWNER and CONTRACTOR or any of CONTRACTOR'S agents or employees.

C. CONTRACTOR exclusively assumes the responsibility for the acts of its employees as they relate to the services to be provided during the course and scope of

their employment. CONTRACTOR, its agents, and employees shall not be entitled to any rights or privileges of OWNER employees and shall not be considered in any manner to be OWNER employees.

D. OWNER shall be permitted to monitor the activities of CONTRACTOR to determine compliance with the terms of the Contract Documents.

E. Contractors are required by law to be licensed and regulated by the Contractors' State License Board. Any contractor not so licensed is subject to penalties under the law and the Construction Agreement will be considered void pursuant to Business and Professions Code Section 7028.7. Any questions concerning a contractor may be referred to the Registrar, Contractors' State License Board, 3132 Bradshaw Road, Post Office Box 2600, Sacramento, California, 95826.

F. Contractors or subcontractors are not qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, as defined in this chapter, unless currently registered and qualified to perform public work pursuant to Labor Code Section 1725.5. This project is subject to monitoring by the Department of Industrial Relations.

ARTICLE 3 CONTRACTOR SELECTION PROCESS AND PROHIBITED INTERESTS

A. As a means of maintaining the integrity of the formal selection process, contacts with individual members of OWNER's Board of Trustees or governing body on behalf of any bidding firm relative to this Project will be considered inappropriate.

B. No official of OWNER who is authorized in such capacity and on behalf of OWNER to negotiate, make, accept, or approve, or to take part in negotiating, making, accepting or approving, any architectural, engineering, inspection, construction, or material supply contract, or any subcontract in connection with construction of the Project, shall have any direct or indirect financial interest in any part of this Project.

C. No officer, employee, architect, attorney, engineer. or inspector of or for OWNER who is authorized in such capacity and on behalf of OWNER to exercise any executive, supervisory, or other similar functions in connection with construction of the Project shall have any direct or indirect financial interest in any part of this Project.

D. CONTRACTOR shall receive no compensation and shall repay OWNER for any compensation received should CONTRACTOR aid, abet, or knowingly participate in any violation of this Article.

ARTICLE 4 CHANGE IN NAME OR NATURE OF CONTRACTOR'S LEGAL ENTITY

Before CONTRACTOR makes any change in the name or legal nature of the CONTRACTOR'S entity, CONTRACTOR shall first notify OWNER in writing and cooperate with OWNER in making such changes as OWNER may request in the Contract Documents.

ARTICLE 5 DEBARRED CONTRACTOR

A. Pursuant to Labor Code Sections 1777.1 and 1777.7, a contractor may be prohibited from bidding or performing work as a subcontractor on a public works project.

B. Any contract on a public works project entered into between a contractor and a debarred subcontractor is void as a matter of law. A debarred subcontractor may not receive any public money for performing work as a subcontractor on a public works contract, and any public money that may have been paid to a debarred subcontractor by a contractor on the Project shall be returned to the awarding body. The contractor shall be responsible for the payment of wages to workers of a debarred subcontractor who has been allowed to work on the Project.

C. Pursuant to Public Contract Code Section 4701, CONTRACTOR shall request the substitution of any subcontractor who has been debarred by the California Labor Commissioner from working as a subcontractor on public work.

ARTICLE 6 SUBCONTRACTING

A. CONTRACTOR agrees to bind each and every subcontractor to the terms of the Contract Documents as far as the terms are applicable to the subcontractor's work. Each subcontract shall contain a reference to Contract Documents, and the terms of the Contract Documents shall be incorporated into and made a part of each subcontract. If CONTRACTOR subcontracts any part of its work under the Construction Agreement, CONTRACTOR shall be responsible to OWNER for any acts and omissions of its subcontractors and of persons either directly or indirectly employed by its subcontractors. Nothing contained in the Contract Documents shall create any contractual relationship between any subcontractor and OWNER.

B. OWNER'S consent to or approval of any subcontractor shall not in any way relieve CONTRACTOR of its obligations under the Contract Documents , and no such consent or approval shall be deemed to waive any provision of the Contract Documents.

C. CONTRACTOR must submit with its bid a Designation of Subcontractors. If CONTRACTOR specifies more than one subcontractor for the same portion of work or fails to specify a subcontractor, and such portion of the work exceeds one-half of one percent of the total bid, CONTRACTOR agrees that it is fully qualified to perform and

shall perform such work itself. The substitution or addition of subcontractors shall be permitted only as authorized by Public Contract Code Sections 4100, et seq.

D. All subcontractors shall be appropriately licensed and registered with DIR to perform the work for which employed in conformity with the laws of the State of California.

E. In accordance with California Business and Professions Code Section 7059, if CONTRACTOR is designated as a "specialty contractor" (as defined in Public Contract Code Section 7058), all of the work to be performed outside of the Contractor's license specialty, except “incidental” work as that term is used in Section 7059(a), shall be performed by a licensed subcontractor in compliance with the Subletting and Subcontracting Fair Practices Act, California Public Contract Code Section 4100, et seq.

F. A copy of each subcontract, if in writing, or if not in writing, then a written statement signed by the Contractor giving the name of the subcontractor and the terms and conditions of such subcontract, shall be filed with OWNER before the subcontractor begins work. Each subcontract will provide for termination in accordance with these General Conditions. Each subcontract shall provide for its annulment by CONTRACTOR at the order of the Architect if in the Architect’s opinion the subcontractor fails to comply with the requirements of the Contract Documents insofar as the same may be applicable to this work.

G. Nothing contained in these General Conditions shall relieve CONTRACTOR of any liability or obligation under the Contract Documents, nor shall any permissible substitution or addition of a subcontractor result in any increase in the contract price or in an extension of time for completion of the Project.

H. CONTRACTOR shall require subcontractors to include the provisions of this article in their sub-subcontracts, if any.

I. Each subcontract applicable to this Project is hereby assigned to OWNER, such assignment to become effective only upon termination of the Construction Agreement for cause pursuant to the Contract Documents, and only as to such subcontracts as OWNER may, in its sole discretion, select and provide written notice of such assignment, and such assignments are subject to the rights and obligations of the surety on any applicable bonds, as detailed in the Contract Documents.

ARTICLE 7 ARCHITECT'S STATUS

A. The Architect shall be OWNER's representative during construction and shall observe the progress and quality of the Work on behalf of OWNER. The Architect shall have the authority to act on behalf of OWNER only to the extent expressly provided in the Contract Documents. The Architect shall have authority to stop work whenever necessary, in the Architect's reasonable opinion, to ensure the proper execution of the Work of the Project.

B. The Architect shall be, in the first instance, the judge of the performance of the Work. The Architect shall exercise authority under the Contract Documents to enforce CONTRACTOR's faithful performance.

C. The Architect shall have all authority and responsibility established by law, including Title 24 of the California Code of Regulations. The Architect has the authority to enforce compliance with the Contract Documents and CONTRACTOR shall promptly comply with instructions from the Architect or an authorized representative of the Architect.

D. On all questions related to quantities, acceptability of material, equipment, or workmanship, execution, progress, or sequence of work, the interpretation of plans, specifications, or drawings, and the acceptable performance of CONTRACTOR, the decision of the Architect shall govern and shall be a condition precedent to any payment, unless otherwise ordered by OWNER. CONTRACTOR shall not impair or delay the progress and completion of the Work by virtue of any question or dispute arising out of or related to the foregoing matters, or the instructions of the Architect relating to them.

E. General supervision and direction of the Work by the Architect shall in no way imply that the Architect or its representatives are in any way responsible for the safety of CONTRACTOR or its employees or that the Architect or its representatives will maintain supervision over CONTRACTOR'S construction methods, means, or personnel other than to ensure that the quality of the finished work is in accordance with the Contract Documents.

ARTICLE 8 PROJECT INSPECTOR AND INSPECTOR FACILITIES

A. One or more Project Inspectors ("IOR"), including specialty Inspectors as required, employed by OWNER and operating under direction of the Architect, in accordance with the requirements of the California Code of Regulations Titles 21 and 24, will be assigned to the Work. All work shall be performed under the observation of or with the knowledge of the Project Inspector. The Project Inspector shall have free access to all parts of the Work at any time. CONTRACTOR shall furnish the Project

Inspector with such information as may be necessary to keep the Project Inspector fully informed regarding the progress and manner of work and the character of materials.

B. Observations by the Project Inspector shall not in any way relieve CONTRACTOR from responsibility for full compliance with all terms and conditions of the Contract Documents, or be construed to lessen to any degree CONTRACTOR's responsibility for providing efficient and capable superintendence.

C. The Project Inspector is not authorized to make changes in the drawings or Specifications, nor shall the Project Inspector's approval of the Work and methods relieve CONTRACTOR of responsibility for the correction of subsequently discovered defects, or from its obligation to fully comply with the Contract Documents.

ARTICLE 9 COPIES FURNISHED

CONTRACTOR will be furnished five copies of the drawings and specifications free of charge. Additional copies may be obtained for the cost of reproduction.

ARTICLE 10 OWNERSHIP OF DRAWINGS

All documents prepared on behalf of OWNER including, without limitation the Plans, Specifications, drawings, and other documents, are instruments of service of the Architect and/or its consultants and are the property of OWNER. Neither CONTRACTOR nor any Subcontractor, Sub-subcontractor, material or equipment supplier or anyone else shall own or claim a copyright in such documents. Unless otherwise indicated, the Architect shall be deemed the author of such documents. Such documents are furnished to CONTRACTOR for use solely with respect to this Project, and are not to be used for any other purpose by CONTRACTOR or any Subcontractor, Sub-subcontractor, or material or equipment supplier, or anyone claiming through them without the express written consent of OWNER. CONTRACTOR, Subcontractors, Sub-subcontractors, and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the documents for use in the execution of their work under the Contract Documents.

ARTICLE 11 DOCUMENTS ON WORK

A. CONTRACTOR shall keep one copy of all Contract Documents, including addenda, change orders, shop drawings, and other modifications, and Titles 19, 21, and 24 of the California Code of Regulations, on the job at all times. The documents shall be kept in good order and accurately marked to record all changes made during construction. The documents shall be available to the Architect and its representatives at all times.

B. CONTRACTOR shall be acquainted with and comply with all statutes and regulations as they relate to this Project. (See particularly the duties of Contractor, Title 24 California Code of Regulations, Sections 4-343.) CONTRACTOR shall also be acquainted with and comply with all provisions of the California Code of Regulations relating to conditions on this Project, particularly Titles 8 and 17.

ARTICLE 12 DRAWINGS AND SPECIFICATIONS

A. Drawings and Specifications are intended to delineate and describe the Project and its component parts sufficiently to enable skilled and competent contractors to intelligently bid upon the work, and to carry the Work to a successful and timely conclusion.

B. Organization of the Specifications into divisions, sections, and articles, and arrangement of drawings, shall not control CONTRACTOR in dividing the Work among subcontractors or in establishing the extent of work to be performed by any trade.

C. The drawings and Specifications describe the work to be performed by CONTRACTOR. Generally, the Specifications describe work which cannot be readily indicated on the drawings and indicate types, qualities, and methods of installation of the various materials and equipment required for the Work. It is not intended to mention every item of work in the Specifications which can be adequately shown on the drawings, or to show on the drawings all items of work described or required by the Specifications even if they could have been shown.

D. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. The Contract Documents are intended to encompass all labor and materials, equipment, and transportation necessary for proper execution of the Work. Any item of work mentioned in the Specifications and not shown on the drawings, or shown on the drawings and not mentioned in the Specifications, shall be provided by CONTRACTOR as if shown in both.

E. All materials or labor for the Work which are shown either by the Drawings or the Specifications (or are reasonably inferable from the Drawings or the Specifications as being necessary to complete the work) shall be provided by CONTRACTOR, whether or not the work is expressly covered in either the Drawings and/or the Specifications. It is intended that the Work be of sound, quality construction. CONTRACTOR must furnish adequate labor and materials to cover installation of all items indicated, described, or implied in the portion of the Work to be performed.

F. Drawings and Specifications are intended to comply with all laws, ordinances, rules and regulations of authorities having jurisdiction, and where referred to in the Contract Documents, such laws, ordinances, rules and regulations shall be considered as a part of the Contract Documents within the limits specified. If CONTRACTOR

observes that the drawings or Specifications are contrary to applicable law, ordinance, rule or regulation, CONTRACTOR shall immediately notify the Architect in writing, and any changes deemed necessary by the Architect shall be made as provided in the Contract Documents for changes in work. If CONTRACTOR performs any work which CONTRACTOR knows or through the exercise of reasonable diligence should have known to be contrary to any law, rule, regulation, or ordinance without seeking and obtaining clarification, CONTRACTOR shall bear any and all costs arising from it, including without limitation the costs of correction without increase or adjustment to the contract price or the time for performance.

G. Materials or work described in words which have a well known technical or trade meaning shall be deemed to refer to those recognized standards.

H. It is not the intention of the Contract Documents to go into detailed descriptions of any materials and/or methods commonly known to the trade under "trade name" or "trade term." The mere mention or notation of such "trade name" or "trade term" shall be considered a sufficient notice to CONTRACTOR that it will be required to complete the Work so named with all its incidental and accessory items according to the best practices of the trade.

I. Naming any material and/or equipment requires CONTRACTOR to furnish and install the named material/equipment, including all incidental and accessory items and/or labor necessary to achieve full and complete functioning of the material and/or equipment according to the best practices of the trade(s) involved, unless specifically noted otherwise.

J. Figured dimensions on drawings shall govern, but work not dimensioned shall be as directed. Work not particularly shown or specified shall be the same as similar parts that are shown or specified. Large scale drawings shall take precedence over smaller scale drawings as to shape and details of construction. Specifications shall govern as to materials, workmanship, and installation procedures, provided however that the drawing or specification calling for the higher quality material or workmanship shall prevail, without additional cost to OWNER.

K. In case of inconsistencies in the descriptions of work to be done, equipment to be provided or material to be used, it is intended that the more stringent, higher quality, and greater quantity of work shall apply, without additional cost to OWNER.

L. All items indicated on the drawings or in the Specifications as future items require CONTRACTOR to provide all the mechanical, electrical, and other necessary service hookups or provisions required to make the equipment function as intended. Such items shall be provided to the location where the future item is indicated to be installed.

M. In the event of an inconsistency between the Construction Agreement or General Conditions and the other various Contract Documents, the Construction Agreement or General Conditions shall control.

N. Drawings and specifications are intended to be fully cooperative and to agree. If CONTRACTOR observes that drawings and Specifications are in conflict, CONTRACTOR shall promptly notify the Architect in writing, requesting clarification. Should CONTRACTOR commence work on any part of the Work without seeking clarification, CONTRACTOR waives any claim for extra work or damages as a result of any ambiguity, conflict, or lack of information. Questions regarding interpretation of drawings and Specifications shall be clarified by the Architect in writing.

O. If CONTRACTOR or its subcontractors, material, or equipment suppliers, or any of their officers, agents, and employees performs, permits, or causes the performance of any work to be done under the Contract Documents which it knows, or should have known, to be in error, inconsistent, or ambiguous, or not sufficiently detailed or explained, CONTRACTOR shall bear any and all resulting costs, including without limitation the costs of correction without increase or adjustment to the contract price or the time for performance.

P. Should clarification by the Architect be deemed new or additional work, the cost shall be adjusted as provided in these General Conditions for "Changes and Extra Work," provided however that requirements calling for the higher quality material or workmanship shall prevail without additional cost to OWNER or time adjustment.

Q. In the event the Architect determines that CONTRACTOR's requests for clarification or interpretation are not justified, or do not reflect adequate, competent supervision or knowledge by CONTRACTOR, or by the subcontractors, CONTRACTOR shall be required to pay the Architect’s reasonable and customary fees in processing and responding to such requests.

R. Some drawings or other documents may be required of CONTRACTOR. If CONTRACTOR performs, permits, or causes the performance of any work under the documents prepared by or on the behalf of CONTRACTOR which document is in error, inconsistent or ambiguous, or not sufficiently detailed or explained, CONTRACTOR shall bear any and all resulting costs, including, without limitation, the cost of correction, without increase to or adjustment in the contract price or the time for performance. In no case shall any subcontractor proceed with the work if uncertain without CONTRACTOR’S written direction and/or approval.

S. If it is found at any time, whether before or after completion of the work, that CONTRACTOR has varied from the drawings and/or Specifications in materials, quality, form, or finish, or in the amount or value of the materials and labor used, the Architect shall make a recommendation either: (1) that all such improper work should be

removed, remade, and replaced, and all work disturbed by these changes be made good at CONTRACTOR'S sole expense; or (2) that OWNER deduct from any amount due CONTRACTOR the sum of money equivalent to the difference in value between the work performed and that called for by the drawings and Specifications. The Architect shall determine such difference in value. At its option, OWNER may pursue either recommendation made by the Architect.

ARTICLE 13 DETAIL DRAWINGS AND SPECIFICATIONS

A. In case of ambiguity, conflict, or lack of information, the Architect shall furnish additional instructions, by means of drawings or otherwise, necessary for proper execution of the Work. All drawings and instructions shall be consistent with the Contract Documents, true developments of them, and reasonably inferable from them. Any additional instructions shall be furnished with reasonable promptness, provided that CONTRACTOR informs the Architect of the relationship of the request to the critical path of construction.

B. Work shall be executed in conformity with the Contract Documents and CONTRACTOR shall do no work without proper drawings and instructions.

C. The Architect will furnish necessary additional details to more fully explain the work, which shall be considered as part of the Contract Documents.

D. Should any details be more elaborate, in the opinion of CONTRACTOR, than scale drawings and specifications warrant, CONTRACTOR shall give written notice to the Architect within five days of receipt of the details. In case no notice is given to the Architect within five days, it will be assumed the details are reasonable development of the scale drawings. In case notice is given, the details will be considered and if found justified the Architect will either modify the drawings or shall recommend to OWNER a change order for any extra work involved.

E. All parts of the construction shall be of the best quality of their respective kinds and CONTRACTOR shall use all diligence to become fully involved in the required construction and finish, and in no case to proceed with the different parts of the Work without first obtaining from the Architect directions and/or drawings as may be necessary for proper performance of the Work.

ARTICLE 14 SHOP DRAWINGS AND SUBMITTALS

A. The term "shop drawing" shall be understood to include, but not be limited to detail design calculations, fabrication and installation drawings, lists, graphs, and operating instructions.

B. CONTRACTOR shall check and verify all field measurements and shall promptly submit six copies of all shop or setting drawings, schedules, and material lists required for the work of various trades, checked and approved by CONTRACTOR.

C. All submittals of shop drawings, catalog cuts, data sheets, schedules, and material lists shall be complete and shall conform to contract drawings and specifications. Except where the preparation of a shop drawing is dependent upon the approval of a prior shop drawing, all shop drawings pertaining to the same class or portion of the work shall be submitted simultaneously.

D. Shop drawings shall be submitted at a time sufficiently early to allow review by the Architect and the Division of State Architect (DSA) if required, and to accommodate the rate of construction progress required under the Contract Documents. CONTRACTOR will be required to pay the Architect's reasonable and customary fees to expedite review of shop drawings which are not submitted in timely fashion.

E. Calculations of a structural nature must be approved by the DSA.

F. All shop drawing submittals shall be accompanied by an accurately completed transmittal form using the format provided by OWNER. Any shop drawing submittal not accompanied by the transmittal form, or where all applicable items on the form are not completed, will be returned for resubmittal. CONTRACTOR may authorize a material or equipment supplier to deal directly with the Architect with regard to shop drawings, however ultimate responsibility for the accuracy and completeness of the information contained in the submittal shall remain with CONTRACTOR.

G. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of shop drawings on various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. At its option, CONTRACTOR or suppliers may obtain quantities of the shop drawing transmittal form at reproduction cost from the Architect.

H. CONTRACTOR's review and approval of shop drawings shall include the following stamp:

> "CONTRACTOR has reviewed and approved not only the field dimensions but the construction criteria and has also made written notation regarding any information in the shop drawings that does not conform to the Contract Documents. This shop drawing has been coordinated with all other shop drawings received to date by CONTRACTOR and this duty of coordination has not been delegated to subcontractors, material suppliers, the Architect, or the engineers on this Project.

_____
Signature of CONTRACTOR"

I. The Architect's review of shop drawings will be limited to checking for general agreement with the Contract Documents, and shall in no way relieve CONTRACTOR of responsibility for errors or omissions contained in them, nor shall the review operate to waive or modify any provision contained in the Contract Documents. The Architect's approval of the drawings or schedules shall not relieve CONTRACTOR of its responsibility for deviations from drawings or specifications unless CONTRACTOR has called the Architect's attention to the deviations, in writing, at the time of submission, and secured the Architect's written approval.

J. Fabricating dimensions, quantities of material, applicable code requirements, and other contract requirements shall be CONTRACTOR's responsibility.

K. Within 21 calendar days after receipt of shop drawings, the Architect will return one or more prints of each drawing to CONTRACTOR with the Architect's comments noted on them.

L. If prints of the shop drawings are returned to CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision of the drawings will not be required. If prints of the shop drawings are returned to CONTRACTOR marked "MAKE CORRECTIONS NOTED," formal resubmittal of the drawings will not be required. If prints of the shop drawings are returned to CONTRACTOR marked "REVISE AND RESUBMIT," CONTRACTOR shall revise the drawings and resubmit six copies of the revised drawings to the Architect. If prints of the shop drawings are returned to CONTRACTOR marked "REJECTED; RESUBMIT," CONTRACTOR shall resubmit six new copies of the drawing to the Architect.

M. CONTRACTOR shall make a complete and acceptable submittal to the Architect by the second submission of drawings. OWNER shall withhold funds due to CONTRACTOR to cover additional costs of the Architect's review beyond the second submission and any other costs incurred by OWNER.

N. Fabrication of an item shall not be commenced before the Architect has reviewed the pertinent shop drawings and returned copies to CONTRACTOR marked "NO EXCEPTIONS TAKEN," or "MAKE CORRECTIONS NOTED." Revisions indicated on shop drawings shall be considered changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.

O. No work represented by required shop drawings shall be purchased or commenced until the applicable submittal has been approved. The work shall conform to the approved shop drawings and all other requirements of the Contract Documents. CONTRACTOR shall not proceed with any related work which may be affected by the

work covered under shop drawings until the applicable shop drawings have been approved, particularly where piping, machinery, equipment, and/or the required arrangements and clearances are involved.

P. **CONTRACTOR SHALL HAVE NO CLAIM FOR DAMAGES OR EXTENSION OF TIME DUE TO ANY DELAY RESULTING FROM CONTRACTOR HAVING TO MAKE REQUIRED REVISIONS TO SHOP DRAWINGS UNLESS THE ARCHITECT'S REVIEW OF THE DRAWINGS IS DELAYED BEYOND THE TIME PROVIDED IN THE CONTRACT DOCUMENTS AND CONTRACTOR CAN ESTABLISH THAT THE ARCHITECT'S DELAY IN REVIEW ACTUALLY RESULTED IN A DELAY IN CONTRACTOR'S CONSTRUCTION SCHEDULE. CONTRACTOR SHALL NOT BE ENTITLED TO ANY CLAIM FOR DAMAGES RESULTING FROM DSA REVIEW EXTENDING BEYOND 15 CALENDAR DAYS AFTER SUBMITTAL. HOWEVER, OWNER MAY CONSIDER AN EXTENSION OF TIME DUE TO ANY DELAY CAUSED BY DSA REVIEW.**

ARTICLE 15 SAMPLES

A. Within 35 calendar days following award of contract, or a shorter time as circumstances require, CONTRACTOR shall furnish for approval all samples required in the Specifications, together with catalogs and supporting data required by the Architect. This provision shall not authorize any extension of time for performance of the work. The Architect shall review the samples, as to conformance with design concept of work and compliance with information given in the Contract Documents, and approve or disapprove them within 10 working days from receipt.

B. Unless specified otherwise, sampling, preparation of samples, and tests shall be in accordance with the latest standards of the American Society for Testing and Materials.

C. Upon demand of the Architect or OWNER, designated samples shall be submitted or tests or examinations and considered before incorporation into the Work. CONTRACTOR shall be solely responsible for delays due to samples not being submitted in time to allow for tests. Acceptance or rejection will be expressed in writing. Work shall be equal to approved samples in every respect. Samples which are of value after testing will remain the property of CONTRACTOR.

D. Work commenced before approval of samples subject to tests or examinations shall be at the sole risk of CONTRACTOR. CONTRACTOR alone shall bear the entire cost of repair, removal, or replacement of work commenced prior to approval of samples subject to tests or examinations.

ARTICLE 16 WORK TO COMPLY WITH APPLICABLE LAWS AND REGULATIONS

A. CONTRACTOR shall give all notices and comply with all laws, ordinances, rules, and regulations relating to the Work required by the Contract Documents.

B. If CONTRACTOR observes that the Drawings and/or Specifications are at variance with any applicable law, ordinance, rule, or regulation, CONTRACTOR shall promptly notify the Architect in writing, and any changes deemed necessary by the Architect shall be made as provided in the Contract Documents for changes in work. If CONTRACTOR performs any work which CONTRACTOR knows, or through the exercise of reasonable care should have known, to be contrary to any laws, ordinances, rules, or regulations, and fails to notify the Architect, CONTRACTOR shall bear all arising costs, including without limitation the costs of correction without increase or adjustment to the contract price or the time for performance. Where Plans, Drawings, or Specifications state that materials, processes, or procedures must be approved by the DSA, State Fire Marshall, or other body or agency, CONTRACTOR shall be responsible for satisfying the requirements of those bodies or agencies.

ARTICLE 17 WORK AND MATERIALS

A. Except as otherwise specifically stated in the Contract Documents, CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of every kind, and all other services and facilities necessary to perform and complete the Work within the time specified.

B. Unless otherwise specified, all materials shall be new and the best of their respective kinds and grades as noted or specified, and workmanship shall be of good quality.

C. Materials shall be furnished in ample quantities and at times to ensure uninterrupted progress of the work and shall be properly stored and protected. CONTRACTOR shall be solely responsible for any damage or loss by weather, theft, or other causes to materials or work under the Contract Documents. After issuance of the Notice to Proceed by OWNER, CONTRACTOR shall place orders for materials and/or equipment as specified so that delivery may be made without delays to the Work. Upon demand from the Architect, CONTRACTOR shall furnish to the Architect documentary evidence showing that orders have been placed.

D. In the event of failure to comply with the above instructions, OWNER reserves the right to place orders for any materials and/or equipment as it may deem advisable in order that the Work may be completed at the date specified in the Contract Documents, and all expenses incidental to procuring the materials and/or equipment shall be paid for by CONTRACTOR.

E. No material, supplies, or equipment for work under the Contract Documents shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest in all or any part is retained by the seller or supplier. CONTRACTOR warrants good title to all material, supplies, and equipment installed or incorporated in the Work, and upon completion of all work agrees to surrender the premises to OWNER, together with all improvements and appurtenances constructed or placed by CONTRACTOR, free from any claims, liens, or charges. CONTRACTOR further agrees that neither CONTRACTOR nor any person, firm, or corporation furnishing any materials or labor for any work covered by the Contract Documents shall have any right to a lien upon the premises or any improvement or appurtenance, except that CONTRACTOR may install metering devices or other equipment of utility companies or political subdivisions, title to which is commonly retained by the utility company or political subdivision. In the event of the installation of any metering device or equipment, CONTRACTOR shall advise OWNER as to its owner. Nothing contained in this article however shall defeat or impair the legal right of persons furnishing material or labor to look to funds due and owing CONTRACTOR for payment. This provision shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing material for work when no formal contract is entered into for such material.

F. Title to new materials and/or equipment, and attendant liability for their protection and safety, shall remain in CONTRACTOR until incorporated in the Work and accepted by OWNER. No part of these materials and/or equipment shall be removed from their place of storage except for immediate installation in the Work, and CONTRACTOR shall keep an accurate inventory of all materials and/or equipment in a manner satisfactory to OWNER or its authorized representative.

G. Price, fitness, and quality being equal with regard to supplies, OWNER may prefer supplies grown, manufactured, or produced in California. OWNER may next prefer supplies partially manufactured, grown, or produced in California provided the bids of suppliers or the prices quoted by them do not exceed by more than five percent the lowest bids/prices quoted by out-of-state suppliers, the major portion of the manufacture of the supplies is not done outside of California, and the public good will be served. (Government Code Sections 4330-4334)

ARTICLE 18 CONTRACTOR'S SUPERVISION, PROSECUTION, AND PROGRESS

A. Unless personally present on premises where the work is being done, CONTRACTOR shall maintain competent project supervision at all times during working hours, which includes but is not limited to a Project Manager and all additional personnel necessary to maintain progress of the Project within the approved contract schedule satisfactory to the Architect. The Project Manager shall not be changed except with the written consent of the Architect. The Project Manager shall represent

CONTRACTOR in its absence and all directions given to the Project Manager shall be binding on CONTRACTOR.

B. Unless personally present on premises where the work is being done, CONTRACTOR shall maintain a competent Superintendent on the work site at all times, satisfactory to the Architect. The Superintendent shall not be changed except with the written consent of the Architect. The Superintendent shall represent CONTRACTOR in its absence and all directions given to the Superintendent shall be binding on CONTRACTOR.

C. Before commencing the Work, CONTRACTOR shall give written notice to OWNER and the Architect of the name, qualifications, and experience of CONTRACTOR's proposed Project Manager and Superintendent. If either the Project Manager or Superintendent is found unsatisfactory by OWNER, CONTRACTOR shall replace that person with one acceptable to the OWNER.

D. CONTRACTOR shall supervise and direct the work competently and efficiently, devoting such attention and applying such skills as may be necessary to perform the Work in accordance with the Contract Documents.

E. Before commencing the Work, CONTRACTOR shall verify all grade lines, levels, and dimensions indicated on the Drawings and shall report any apparent error or inconsistencies to the Architect before commencing work. CONTRACTOR shall not proceed until reported apparent errors and inconsistencies are corrected or otherwise resolved by the Architect and OWNER.

F. CONTRACTOR shall establish and maintain all construction grades, lines, and bench marks, and be responsible for their accuracy and protection.

G. CONTRACTOR represents itself to OWNER as a skilled, knowledgeable, and experienced CONTRACTOR who will or has carefully studied and compared the Contract Documents with each other, and CONTRACTOR further represents it has or shall at once report to the Architect any errors, inconsistencies, or omissions discovered in them. CONTRACTOR shall be liable to OWNER for damage resulting from errors, inconsistencies, or omissions in the Contract Documents that CONTRACTOR either:

1. Recognized and knowingly failed to report; or

2. Should have recognized, and which a similarly skilled, knowledgeable, and experienced contractor would have discovered, which CONTRACTOR negligently failed to recognize and report.

H. CONTRACTOR shall verify all indicated dimensions before ordering materials or equipment, or before performing work. CONTRACTOR shall take field measurements,

verify field conditions, and carefully compare the field measurements and conditions and other information known to CONTRACTOR with the Contract Documents before commencing work. Errors, inconsistencies, or omissions discovered shall be reported to OWNER at once. Upon commencement of any item of work, CONTRACTOR shall be responsible for dimensions related to the item of work and shall make any corrections necessary to make work properly fit at no additional cost to OWNER. This responsibility for verification of dimensions is a non-delegable duty and may not be shifted to subcontractors or agents.

I. Omissions from the Plans, drawings, or Specifications, or the mis-description of details of work which are manifestly necessary to carry out the intent of the Plans, drawings, and Specifications, or which are customarily performed, shall not relieve CONTRACTOR from performing such omitted or mis-described work, but they shall be performed as if fully and correctly set forth and described in the Plans, drawings, and Specifications.

J. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. CONTRACTOR shall be responsible to see that the finished work complies accurately and completely with the Contract Documents

ARTICLE 19 SUBSTITUTIONS

A. CONTRACTOR shall follow all instructions and requirements for substitutions set forth in the Instructions to Bidders and in this article.

B. OWNER desires that whenever possible all substitution requests be resolved prior to contract award. For that reason, no substitution requests, whether of “equal” materials, process, service, equipment, or otherwise, may be made after the bid date except by the express written permission of OWNER and on such terms as OWNER may require, or in the case of an emergency as where a specified material, process, service, equipment or other item has become unavailable through no fault of CONTRACTOR.

C. As to any emergency substitution request, CONTRACTOR shall timely submit the request, together with substantiating data, including substitution warranties, in order to prevent delays arising from the substitution request.

D. With respect to all proposed substitutions:

1. Every substitution request shall be on the substitution request form designated by OWNER, if any, and shall be accompanied by all substantiating data.

2. CONTRACTOR shall furnish with its substitution request all drawings, Specifications, samples, performance data, calculations, and other information as may be required to assist the Architect and OWNER in determining whether the proposed substitution is acceptable, including but not limited to the following:

a. Identify product by Specifications section and article numbers; provide manufacturer's name and address, trade name of product, and model or catalog number; list fabricators and suppliers as appropriate.

b. Attach product data as required by Specifications.

c. List similar projects using product, dates of installation, and names of Architect/Engineer and owner.

d. Give itemized comparison of proposed substitution with specified product, listing variations and reference to Specifications section and article numbers.

e. Give quality and performance comparison between proposed substitution and specified product.

f. Give cost data comparing proposed substitution with specified product and amount of net change to contract sum.

g. Identify any required license fees or royalties.

h. List availability of maintenance services and replacement materials.

i. State the effect of the substitution on the construction schedule, and the effect of any changes required in other work or products; include a document waiving rights to additional payment or time that may become necessary because of the failure of the substitution to perform adequately.

3. OWNER is not responsible for locating or securing any information which is not included in any substantiating data.

4. The proposed substitution must be, in the opinion of OWNER, substantially equal or better in every respect to what is specified. The burden of proof as to the quality or suitability of proposed substitutions shall be borne by CONTRACTOR.

5. With the assistance of the Architect, OWNER shall be the sole judge as to the quality and suitability of proposed substituted items, and decisions of the OWNER shall be final and conclusive.

6. All substitutions shall be submitted with a substitution warranty. Any substitution requests submitted without the warranty will not be considered, but will be returned to CONTRACTOR without review or evaluation. If required by OWNER, CONTRACTOR shall provide an extended warranty for the requested substitution.

7. No extension of time shall be granted if the extension request arises from a request for substitution, whether by reason of delay in making the request, delay in OWNER's approval of the request, delay in obtaining other governmental approvals, delay in coordination of substitutions into or with other work or equipment, delay in obtaining the substituted items, increased time of installation or performance, or for any other reason.

8. Once any part or all of a substitution request has been denied, it is considered always denied.

9. A substitution request shall be submitted separately from any other submittal and shall be clearly marked as a "request for substitution."

10. If the substitution is accepted, CONTRACTOR shall bear all costs and be solely and directly responsible for fitting accepted substitute materials and equipment into the available space in a manner acceptable to the Architect and OWNER, and for the proper operation of the substituted equipment with other equipment with which it may be associated. In addition, CONTRACTOR shall acknowledge in writing on CONTRACTOR's letterhead, that CONTRACTOR accepts complete responsibility for additional costs required for modifications to building or other materials and equipment and additional coordination of work.

11. Any additional time, including Architect review time, and any additional coordination, inspection, materials, equipment, labor, tools, warranty extension, or other items necessary to either accomplish a substitution or arising as a result of a substitution request will be the sole responsibility of and at the sole expense of CONTRACTOR, who will reimburse OWNER for review or redesign services associated with approval by the Architect and obtaining all required approvals by other agencies.

12. CONTRACTOR shall also be responsible for meeting all code requirements whether local, city, county, state, federal, or other.

F. If the substitution requested by CONTRACTOR is not substantially equal or better in every respect to that specified, in the opinion of DISTRCT, CONTRACTOR shall provide and/or perform as specified.

G. In the event CONTRACTOR furnishes a material, process, service, or equipment more expensive than that specified, the difference in cost of such material, process, service, or equipment furnished shall be borne by CONTRACTOR. Any difference in cost between an approved substitution which is lower in cost than the originally specified item shall be refunded by CONTRACTOR to OWNER.

H. Any engineering, design, or approval agencies' fees required to make adjustments in material or work of all trades directly or indirectly affected by the approved substitution shall be borne entirely by CONTRACTOR. If a substitution is approved, any additional time required to obtain shop drawings, order materials, make modifications, perform testing, or whatever else is necessary to make the substitution function properly in place of the originally specified item shall be borne solely by CONTRACTOR. It will also be CONTRACTOR’s responsibility to acquire and install the substituted item in the time frame allowed under the Contract Documents. No time extension need be granted to CONTRACTOR for any substitution, except as OWNER in its sole discretion may deem appropriate.

ARTICLE 20 PROTECTION OF WORK AND PROPERTY

A. CONTRACTOR shall be responsible for all damages to persons or property which occur as a result of CONTRACTOR's fault or negligence in connection with performance under the Contract Documents, and for the proper care and protection of all materials delivered and work performed until completion and final acceptance by OWNER. With the exception of damage to the Work caused by "acts of God," as defined in Public Contract Code 7105, CONTRACTOR assumes the risk for damage or destruction of any or all work performed under the Contract Documents. CONTRACTOR shall adequately protect adjacent property from settlement or loss of lateral support as provided by law and this article.

B. CONTRACTOR shall take, and require subcontractors to take, all necessary precautions for safety of workers and shall comply with all applicable federal, state, local, and other safety laws, standards, orders, rules, regulations, and building codes to prevent accidents or injury to persons on, about, or adjacent to the work site and to provide a safe and healthful place of employment. CONTRACTOR shall furnish, erect, and properly maintain at all times, as directed by OWNER or the Architect, or required by conditions and progress of work, all necessary safety devices, safeguards, construction canopies, signs, audible devices for protection of the blind, safety rails, belts and nets, barriers, lights, and watchmen for protection of workers and the public, and shall post danger signs warning against hazards created by such features in the course of construction. CONTRACTOR shall designate a responsible employee whose

duty shall be to post information regarding protection and obligations of workers and other notices required under occupational safety and health laws, to comply with reporting and other occupational safety requirements, and to protect the life, safety, and health of workers. The name and position of the person so designated shall be reported in writing to OWNER by CONTRACTOR. CONTRACTOR shall correct any violation of safety laws, standards, orders, rules, or regulations. Upon issuance of a citation or notice of violation by the California Division of Occupational Safety and Health, the violation shall be corrected immediately by CONTRACTOR at CONTRACTOR's expense.

C. In an emergency affecting safety of life, work, or adjoining property, CONTRACTOR is permitted to act at its discretion without special instruction or authorization from the Architect or OWNER to prevent any threatened loss or injury, and CONTRACTOR shall act if authorized or instructed by the Architect or OWNER. Any compensation claimed by CONTRACTOR for emergency work shall be determined according to the Contract Documents.

D. CONTRACTOR shall (unless waived by OWNER in writing):

1. Provide heat, covering, and enclosures necessary to protect all work, materials, equipment, appliances, and tools against damage by weather conditions;

2. Take adequate precautions to protect existing sidewalks, curbs, pavements, utilities, adjoining property, and structures, and avoid damage to them, and repair any damage caused by construction operations;

3. When performing new construction on existing sites, become informed and take into specific account the maturity of the students on the site, and perform work which may interfere with school routine before or after school hours; enclose the work area with a substantial barricade and arrange work to cause a minimum of inconvenience and danger to students and staff in their regular school activities;

4. Provide substantial barricades around any shrubs or trees to be preserved;

5. Deliver materials to the building area over the route designated by the Architect;

6. Take preventative measures to eliminate excessive dust;

7. Confine apparatus, storage of materials, and the operations of its workers within limits indicated by law, ordinances, permits, or directions of the Architect and not unreasonably encumber the premises with materials;

8. Enforce all instructions of OWNER and the Architect regarding signs, advertising, fires, danger signals, barricades, and smoking, and require that all persons employed on the Work comply with all regulations while on the construction site;

9. Exercise reasonable care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners; if markers are disturbed, they shall be replaced by an approved civil engineer at no cost to OWNER.

ARTICLE 21 USE OF ASBESTOS OR LEAD MATERIALS/PRODUCTS

A. CONTRACTOR shall not use any asbestos or lead containing products or materials in performing the work under the Contract Documents. Upon completion of the Project, CONTRACTOR shall certify in writing to OWNER that no asbestos or lead containing materials or products were used by CONTRACTOR or any subcontractor in performing the work required by the Contract Documents.

B. Should asbestos containing materials be installed by CONTRACTOR in violation of this certification, or if removal of asbestos containing materials is otherwise a part of the Project, decontaminations and removals will meet the following criteria:

1. Decontamination and removal of work found to contain asbestos or work installed with asbestos containing equipment shall be done only under the supervision of a qualified consultant, knowledgeable in the field of asbestos abatement and accredited by Cal-OSHA.

2. Any asbestos removal contractor shall be a Cal-OSHA accredited contractor qualified in the removal of asbestos and shall be chosen and approved by the asbestos consultant who shall have sole discretion and final determination in this matter.

3. The asbestos consultant shall be chosen and approved by OWNER who shall have sole discretion and final determination in this matter.

4. The work will not be accepted until asbestos contamination is reduced to levels deemed acceptable by the asbestos consultant.

C. Cost of all asbestos removal, including but not limited to the cost of an asbestos removal contractor, the cost of the asbestos consultant, analytical and laboratory fees,

time delays, and additional costs as may be incurred by OWNER shall be borne entirely by CONTRACTOR.

D. Interface of work for the Project with work containing asbestos shall be executed by CONTRACTOR at CONTRACTOR's risk and at CONTRACTOR's discretion with full knowledge of the currently accepted standards, hazards, risks, and liabilities associated with asbestos work and asbestos containing materials. By execution of the Construction Agreement, CONTRACTOR acknowledges the above and agrees to hold harmless OWNER, its governing board, or other governing body, employees, agents, and the Architect and assigns for all asbestos liability which may be associated with this work. CONTRACTOR further agrees to instruct CONTRACTOR's employees with respect to the above standards, hazards, risks, and liabilities.

E. Should lead containing materials be installed by CONTRACTOR in violation of this certification, or if removal of lead containing materials is part of the Project, decontaminations and removals will meet the criteria approved by OWNER.

F. The cost of all removals or decontaminations resulting from the installation of materials in violation of this certification shall be at the sole expense of CONTRACTOR.

ARTICLE 22 LAYOUT AND FIELD ENGINEERING

All field engineering required for laying out this Work and establishing grades for earthwork operations shall be furnished by CONTRACTOR at its expense. The work shall be done by a qualified civil engineer approved by the Architect. "As-Built" drawings of site development and utilities' locations and inverts shall be prepared by an approved civil engineer.

ARTICLE 23 UTILITIES

A. All utilities, including but not limited to electricity, water, gas, and telephone used on the Work, shall be furnished and paid for by CONTRACTOR. CONTRACTOR shall furnish and install necessary temporary distribution systems, including meters if necessary, from distribution points to points on the site where the utility is necessary to perform the work. Upon completion of the Work, CONTRACTOR shall remove all temporary distribution systems.

B. If this Project is for an addition to an existing facility, CONTRACTOR may use existing OWNER utilities, with the written permission of OWNER, by making prearranged payments to OWNER for utilities used by CONTRACTOR for construction.

ARTICLE 24 UTILITIES: REMOVAL, RESTORATION

A. Pursuant to Government Code section 4215, OWNER assumes the responsibility for removal, relocation, and protection of utilities located on the construction site at the time of commencement of construction with respect to any main or trunkline utility facilities which are not identified in the Plans and Specifications. CONTRACTOR shall not be assessed any delay in completion of the Project caused by OWNER's failure to provide for removal or relocation of utility facilities. OWNER shall compensate CONTRACTOR for the costs of locating, repairing damage not due to CONTRACTOR's failure to exercise reasonable care, and removing or relocating any utility facilities not indicated in the Plans and Specifications with reasonable accuracy, and for equipment necessarily idle during the work, using the provisions of the Contract Documents on changes in the Work.

B. This article shall not be construed to preclude assessment against CONTRACTOR for any other delays in completion of the Work. Nothing in this article shall be deemed to require OWNER to indicate the presence of existing service laterals or appurtenances whenever the presence of those utilities on the construction site can be inferred from the presence of other visible facilities, such as buildings or meter junction boxes on or adjacent to the construction site.

C. If while performing work under the Contract Documents, CONTRACTOR discovers utility facilities not identified by OWNER in the contract Plans or Specifications, CONTRACTOR shall immediately notify OWNER and the utility in writing.

D. As part of the work to be performed, CONTRACTOR shall provide the notices and proceed in accordance with Government Code Sections 4216.2, 4216.3, and 4216.4, and pay all fees charged pursuant to Government Code Section 4216, et seq.

ARTICLE 25 SANITARY FACILITIES

CONTRACTOR shall provide temporary sanitary toilet facilities as required by law and additional facilities as directed by the Project Inspector for the use of all workers. The facilities shall be maintained in a sanitary condition and left at the site until removal is directed by the Project Inspector. Use of toilet facilities contained in the Work under construction shall not be permitted except with the approval of the Project Inspector.

ARTICLE 26 LABOR—FIRST AID

CONTRACTOR shall maintain emergency first aid treatment on the Project for all workers of CONTRACTOR or any subcontractors on the Project, and shall ensure compliance with the Federal Occupational Safety and Health Act of 1970 (29 U.S.C.A., Section 651 et seq.).

ARTICLE 27 CHANGES AND EXTRA WORK

A. As used in this article, the following definitions shall apply:

1. "Labor" means any amount(s) paid directly to non-supervisory workers (up to and including general foreman) in the form of employee wages and benefits in order to perform the Work. These costs shall include documented payroll cost (wages, payroll taxes, fringe benefits, workers compensation) and general liability insurance as submitted and approved by OWNER.

2. "Material" means all products, equipment, and devices that are physically incorporated into the work to be performed. Any costs or equipment, facilities, or services not physically incorporated in the work to be performed but necessary for its completion shall be considered "overhead." Cash or trade discounts available to the purchaser shall be credited to OWNER. Material costs secured by other than direct purchase and billing will be the price paid to the actual supplier as determined by OWNER. Markup will not be allowed. If cost of materials is deemed excessive, the price will be determined to be the lowest current wholesale price delivered to the site, less cash or trade discount.

3. "Equipment" costs shall include transportation and setup costs, if CONTRACTOR can substantiate that the Work could not have been performed economically with equipment already at the site. Rental costs shall not exceed rates set forth in the then-current "Rental Rate Blue Book," published by Dataquest, Inc., Palo Alto, California, as adjusted to this region. Owned equipment costs shall not exceed rates set forth in the then-current "Cost Reference Guide for Construction Equipment," published by Dataquest. Hours of usage must be documented by CONTRACTOR in order to be the basis for equipment utilization charges for Change Orders. CONTRACTOR will not be allowed to charge for idle equipment.

4. "Overhead" means any necessary costs and expenses incurred in the performance of the Work excluding "labor," "materials," and "equipment" as defined above.

B. Without invalidating the Contract Documents, OWNER may order extra work or make changes by altering, adding to, or deducting from the Work, and the contract sum shall be adjusted accordingly. All the work shall be subject to the conditions of the Contract Documents, except that any claim for extension of time caused by changes shall be adjusted at the time of ordering the change, with adjustments to time being made after CONTRACTOR has justified, through documentation, the impact on the critical path of the Project.

C. In giving instructions, the Architect shall have authority to make minor changes in the Work not involving a change in cost and not inconsistent with purposes of the Project, subject to DSA approval. If so authorized by OWNER, OWNER's Representative, if one has been identified, may authorize changes in work involving a change in cost that does not exceed $15,000. Otherwise, except in an emergency endangering life or property, no extra work or change shall be performed unless pursuant to a written order from OWNER, and no claim for any addition to the contract amount or time shall be valid unless by written order of OWNER. A Change Order will not be officially approved until ratified by OWNER's Board of Trustees or other governing body.

D. If the Architect determines that the work required to be done constitutes extra work outside the scope of the Contract Documents, the Architect shall send a request for a detailed proposal to CONTRACTOR. CONTRACTOR will respond with a detailed proposal within five calendar days of receipt of the request for proposal. If the work is to be performed by a subcontractor, CONTRACTOR's proposal must include a bid from the subcontractor.

E. If the Architect determines the work required does not constitute extra work, or work for which CONTRACTOR may recover additional compensation, the Architect shall so notify CONTRACTOR. If CONTRACTOR is not in agreement with the determination by the Architect, CONTRACTOR shall immediately give notice of any claim as provided in the Contract Documents. CONTRACTOR shall perform the required work in timely fashion.

F. At the discretion of OWNER, the value of any extra work, change, or deduction shall be determined in one or more of the following ways:

1. By acceptable lump sum proposal from CONTRACTOR, a total sum for the changed work may be mutually determined by OWNER and CONTRACTOR. CONTRACTOR shall furnish a breakdown of the proposed lump sum cost satisfactory to OWNER, which shall be full and final compensation for the change, including time adjustment.

2. By contract unit prices contained in CONTRACTOR's original bid and incorporated in the Contract Documents, or fixed by subsequent agreement between OWNER and CONTRACTOR. Where payment for Change Orders is based on unit prices stipulated in CONTRACTOR's bid, those unit prices shall constitute the total equitable adjustment due for the change. If a change is ordered in an item or work covered by a contract unit price, and the change does not involve a substantial change in the character of the work from that shown on the Plans or included in the Specifications, an adjustment in payment will be made based upon the increase or decrease in quantity and the contract unit price. In the case of such an increase or decrease in a major bid Item, the use of

this basis for the adjustment of payment will be limited to that portion of the change which, together with all previous changes to that item, is not in excess of 25 percent of the total cost of such item based on the original quantity and contract unit price. If a change is ordered in an item of work covered by a contract unit price, and the change does involve a substantial change in the character of the work from that shown on the Plans or included in Specifications, an adjustment in payment will be made in accordance with other sections of this article. Should any contract item be deleted in its entirety, payment will be made only for actual costs incurred prior to notification of such deletion.

3. Stipulated contract unit prices are those established by OWNER in the Contract Documents, as distinguished from contract unit prices submitted by CONTRACTOR, and may be used for the adjustment of contract changes. Whether set forth in the Contract Documents or subsequently agreed upon, all contract unit prices shall include overhead, profit, and increased premium on the Surety Bonds.

4. By cost of labor, material, equipment, and subcontract, plus a percentage for overhead and profit. If the value is determined by this method the following requirements shall apply:

a. Daily reports by CONTRACTOR, as follows:

(i) General. At the close of each working day, CONTRACTOR shall submit a daily report to the Architect and the Project Inspector on forms approved by OWNER, together with applicable delivery tickets listing all labor, materials, and equipment involved for that day, and for other services and expenditures, when authorized, concerning extra work items. An attempt shall be made to reconcile the report daily, and it shall be signed by the Architect and CONTRACTOR. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the report. Reports by subcontractors or others shall be submitted through CONTRACTOR.

(ii) Labor. The report shall show names of workers, classifications, and hours worked and hourly rate. Project supervision expenses, including for foremen and above, are not allowed.

(iii) Materials. The report shall describe and list quantities of materials used and unit cost.

(iv) Equipment. The report shall show the type of equipment, size, identification number, and hours of operation, including loading and transportation, if applicable, and hourly/daily costs.

(v) Other Services and Expenditures. Other services and expenditures shall be described in such detail as OWNER may require.

b. Basis for Establishing Costs

(i) Labor. The costs of labor will be the actual cost for wages prevailing locally for each craft classification or type of worker at the time the extra work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from federal, state, or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. The use of labor classifications which would increase the extra work cost will not be permitted unless CONTRACTOR establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

(ii) Materials. The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available and delivered to the work site in the quantities involved, plus sales tax, freight, and delivery. OWNER reserves the right to approve materials and sources of supply, or to supply materials to CONTRACTOR if necessary for the progress of the work. No markup shall be applied to any material provided by OWNER.

(iii) Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of $100 or less or where an invoice is not provided. Regardless of ownership, the rates to be used in determining equipment rental costs shall not exceed listed rates prevailing locally at equipment rental sources or distributors at the time the work is performed. The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals. Necessary loading and transportation costs for equipment used on the extra work shall be included. If equipment is used intermittently, and when not in use could be returned to its rental source at less expense to OWNER than holding it at the work site, it shall be

returned, unless CONTRACTOR elects to keep it at the work site at no expense to OWNER. All equipment shall be acceptable to the Architect in good working condition, and suitable for the purpose for which it is to be used. Manufacturer's ratings and manufacturer's approved modifications shall be used to classify equipment and it shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

(iv) Other Items. OWNER may authorize other items which may be required on the extra work. These items include labor, services, material, and equipment which are different in their nature from those required by the work and which are of a type not ordinarily available from CONTRACTOR or any of the Subcontractors. Detailed invoices covering all such items shall be submitted with the request for payment.

(v) Invoices. Vendors' invoices for material, equipment rental, and other expenditures shall be submitted with the request for payment. If the request for payment is not substantiated by invoices or other documentation, OWNER may establish the cost of the item involved at the lowest price which was current at the time of the report.

c. The following form shall be used by OWNER and CONTRACTOR as applicable to communicate proposed additions and deductions to the Contract Documents.

	EXTRA	CREDIT
(i) Material (attached itemized quantity and unit cost plus sales tax		
(ii) Labor (attached itemized hours and rates)		
(iii) Subtotal		
(iv) If Subcontractor performed work, add Subcontractor's overhead and profit to portions performed by it, not to exceed 10% of Item (iii) above		
(v) Subtotal		
(vi) CONTRACTOR's Overhead and Profit, including any increased bond costs, not to exceed 10% of Item (v)		
(viii) Total		

5. **IT IS EXPRESSLY UNDERSTOOD THAT THE VALUE OF SUCH EXTRA WORK OR CHANGES AS DETERMINED BY ANY OF THESE METHODS EXPRESSLY INCLUDES ANY AND ALL OF CONTRACTOR'S COSTS AND EXPENSES, BOTH DIRECT AND INDIRECT, RESULTING FROM DELAYS OR ADDITIONAL TIME REQUIRED ON THE PROJECT, OR RESULTING FROM ACCELERATED WORK TO AVOID DELAYS TO THE PROJECT**.

G. For changes that increase the contract price, CONTRACTOR may include amounts for overhead and profit. CONTRACTOR's overhead (general and administrative) and profit shall include, but not be limited to additional bond costs, additional job site facilities costs, additional home and field office costs, additional administrative costs, additional cleaning, and additional project supervision costs (which includes but is not limited to a Project Manager and any and all additional personnel necessary to maintain the project progress within the approved contract schedule).

H. CONTRACTOR'S overhead, profit, and additional bond costs on the cost of work performed by CONTRACTOR shall be a total sum not exceeding 10 percent of the cost of work.

I. CONTRACTOR'S overhead, profit, and additional bond costs on the cost of work performed by Subcontractors of all tiers shall be a total sum not exceeding 10 percent of those costs.

J. Subcontractors' (all tiers) overhead and profit on the cost of work performed by Subcontractor shall be a total sum not exceeding 10 percent of the cost of labor, materials, rentals, etc.

K. Overhead and profit shall not be applied to taxes, delivery charges, and insurance by CONTRACTOR or its subcontractors or sub-subcontractors.

L. Before CONTRACTOR is authorized to proceed with extra work or changes on the basis set forth in this Article, OWNER and CONTRACTOR shall be in complete agreement on what the term "costs" shall include and the percentage amount of fixed fee CONTRACTOR is to charge.

M. If CONTRACTOR should claim that any instruction, request, drawing, specification, action, condition, omission, default, or other situation constitutes a change, extra work, or otherwise obligates OWNER to pay additional compensation to CONTRACTOR or to grant an extension of time, or constitutes a waiver of any provision in the Contract Documents, CONTRACTOR shall notify OWNER in writing of such claim within five calendar days from the date CONTRACTOR has actual or constructive notice of the factual basis supporting the claim. The notice shall state the factual basis for the

claim and cite in detail the Contract Documents (including plans and specifications) upon which the claim is based. CONTRACTOR's failure to notify OWNER within the five-day period shall be deemed a waiver and relinquishment of such a claim. If the notice is given within the specified time, the procedure for its consideration shall be as stated in these General Conditions. In the event of failure to agree, the matter shall be treated as a claim following the claims procedures in the Contract Documents.

N. Costs which shall not be paid in Change Orders under the Contract Documents include but are not limited to interest costs of any type, claim preparation or filing costs, costs in preparing or reviewing proposed change orders or proposals, CQR's, ASI's, etc., lost revenue, lost profit, lost income or earnings, rescheduling costs, costs of idled equipment, lost earnings or interest on unpaid retainage, claims consulting costs, costs of corporate officers or staff visiting the site, fluctuation of foreign currency conversion or exchange rate costs, or loss of other business.

O. Notwithstanding any other provision in the Contract Documents, the adjustment in the contract price, if any, and the adjustment in the contract time, if any, set out in a change order shall constitute the entire compensation and/or adjustment in the contract time due CONTRACTOR arising out of the change in the work covered by the change order, including any extensions of time, unless otherwise expressly stated in the change order. The amount of any compensation due CONTRACTOR shall be calculated pursuant to this Article. The compensation shall not include any additional charges not set forth in this Article and shall not include delay damages due to processing a change order or refusal to sign a change order, or any indirect, consequential, or incidental costs, including any project management costs, extended home office and field office overhead, administrative costs, or profit except as such matters may be authorized under this Article.

P. In furtherance of the intent to settle all change orders fully and finally at the issuance date of the change order, the following shall be expressly incorporated in writing and deemed incorporated in all change orders:

> **THE COMPENSATION (TIME AND COST) SET FORTH IN THIS CHANGE ORDER COMPRISES THE TOTAL COMPENSATION DUE CONTRACTOR FOR THE CHANGE DEFINED IN THE CHANGE ORDER, INCLUDING IMPACT ON UNCHANGED WORK. ACCEPTANCE OF THIS CHANGE ORDER CONSTITUTES A FULL AND COMPLETE ACCORD AND SATISFACTION OF ANY AND ALL CLAIMS BY CONTRACTOR ARISING OUT OF OR RELATING TO THE CHANGE ORDER, INCLUDING BUT NOT LIMITED TO CLAIMS FOR CONTRACT BALANCE AND RETENTION, TIME, EXTENDED FIELD OR HOME OFFICE, OR OTHER OVERHEAD, ALL ACCELERATION, IMPACT, DISRUPTION AND DELAY DAMAGES, ANY AND ALL OTHER DIRECT AND/OR INDIRECT COSTS, CLAIMS BY**

SUBCONTRACTORS AND SUPPLIERS, AND ANY AND ALL OTHER CLAIMS AGAINST OWNER FOR TIME OR MONEY, FROM ANY SOURCE AND UNDER ANY LEGAL THEORY WHATSOEVER, AS TO THE SUBJECT OF THIS CHANGE ORDER. NO SIGNATURE UNDER PROTEST OR ACCOMPANIED BY RESERVATION OF RIGHTS OR PROTEST LANGUAGE, OR ANY OTHER ATTEMPTS TO AVOID SUCH WAIVER SHALL BE OF ANY FORCE OR EFFECT WHATSOEVER. NO ADDITIONS OR DELETIONS TO THIS CHANGE ORDER SHALL BE ALLOWED, EXCEPT WITH WRITTEN PERMISSION OF OWNER.

Q. Within 10 days of the notice to proceed, CONTRACTOR shall submit a detailed list of the field office overhead cost components which are time related and which represent costs incurred as a direct result of time extensions. No allowance for overhead costs and no profit allowance will be allowed on the extended daily field overhead cost component of the change Order. The deviation of an extended home office overhead rate and its application to contract time extensions shall not be allowed.

ARTICLE 28 CORRECTION OF WORK BEFORE FINAL PAYMENT

A. CONTRACTOR shall promptly remove from the premises all work identified by OWNER as failing to conform to the Contract Documents, whether incorporated or not. CONTRACTOR shall promptly replace and repair its own work to comply with the Contract Documents, without additional expense to OWNER, and shall bear the expense of making good all work of other contractors destroyed or damaged by that removal or replacement, including compensation for the Architect's additional services.

B. If CONTRACTOR does not remove work within a reasonable time following written notification, OWNER may remove and store the material at CONTRACTOR'S expense. If CONTRACTOR does not pay the expenses of removal within 10 days, OWNER may sell the materials at auction or private sale upon 10 days' written notice, and shall account for any net proceeds after deducting all costs and expenses that should have been borne by CONTRACTOR.

ARTICLE 29 DEDUCTIONS FOR UNCORRECTED WORK

A. If CONTRACTOR defaults or neglects to carry out the Work in accordance with the Contract Documents, or fails to perform any provision of the Contract Documents, after 10 days' written notice to CONTRACTOR, OWNER may make good such deficiencies without prejudice to any other remedy it may have.

B. OWNER shall reduce the total contract price by the cost of making good such deficiencies.

C. If OWNER deems it inexpedient to correct work not performed in compliance with the Contract Documents, an equitable deduction from the contract price shall be made.

ARTICLE 30 CLEANING UP

A. CONTRACTOR shall at all times keep the work site free from debris such as waste, rubbish, and excess materials and equipment caused by this Work. CONTRACTOR shall not leave debris under, in, or about the work site, but shall promptly remove all items.

B. Upon completion of the Work, CONTRACTOR shall clean the interior and exterior of each building, including fixtures, equipment, walls, floors, ceilings, roofs, window sills and ledges, horizontal projections, and any areas where debris has collected. CONTRACTOR shall clean and polish all glass, plumbing fixtures, and finish hardware and similar finish surfaces and equipment, and remove temporary fencing, barricades, planking, sanitary facilities, and similar temporary facilities from the site.

C. If CONTRACTOR fails to clean up at the completion of the Work, OWNER may do so and the cost for such cleanup shall be charged back to CONTRACTOR and may be deducted from future progress or final payments.

D. CONTRACTOR shall not include cleaning as an additional line item for change order payments. Cleaning is included in the overhead expenses included in the CONTRACTOR’s and/or Subcontractor’s overhead and profit percentage.

ARTICLE 31 ACCESS TO WORK

OWNER and its representatives shall at all times have access to the Work wherever it is in preparation or progress. CONTRACTOR shall provide safe and proper facilities for access so OWNER's representatives may perform their functions under the Contract Documents.

ARTICLE 32 GUARANTEE

A. CONTRACTOR warrants that the Work, including any equipment furnished by CONTRACTOR, shall be:

1. Free from defects in workmanship and material;

2. Free from defects in any design performed by CONTRACTOR;

3. New, and conform and perform to the requirements stated in the Specifications, and where detail requirements are not so stated, shall conform to applicable industry standards; and

4. Suitable for the use stated in the Specifications.

B. The warranty period for discovery of defective work shall commence on the date stamped on the Notice of Completion to verify recording with the County, and shall continue for the period set forth in the Specifications or for one year if not so specified. If during the warranty period the Work is not available for use due to defective work, such time of unavailability shall not be counted as part of the warranty period. The warranty period for corrected defective work shall continue for a duration equivalent to the original warranty period.

C. OWNER shall give CONTRACTOR prompt written notice after discovery of any defective work. CONTRACTOR shall correct any such defective work, as well as any damage to any other part of the Work resulting from such defective work, and provide repair, replacement, or reimbursement, at its sole expense, in a manner approved by OWNER and with due diligence and dispatch as required to make the Work ready for use by OWNER, ordinary wear and tear, unusual abuse, or neglect excepted. Such corrections shall include but not be limited to any necessary adjustments, modifications, changes of design (unless of OWNER's design), removal, repair, replacement, or reinstallation, and shall include all necessary parts, materials, tools, equipment, transportation charges, and labor as may be necessary, and cost of removal. Replacement shall be performed at a time and in such a manner so as to minimize the disruption to OWNER's use of the Work.

D. In the event CONTRACTOR or Surety fails to commence and pursue with diligence any replacements or repairs within one week after being notified in writing, OWNER is authorized to proceed to have any defects repaired at the expense of CONTRACTOR and Surety, and CONTRACTOR and Surety agree to pay the costs and charges immediately on demand.

E. If defective work creates a dangerous condition, in the opinion of OWNER, or requires immediate correction or attention to prevent further loss to OWNER or to prevent interruption or operations of OWNER, OWNER shall attempt to give the notice required by this Article. If CONTRACTOR or Surety cannot be contacted or neither complies with OWNER's request for correction within a reasonable time, as determined by OWNER, without regard to the provisions of this Article, OWNER may proceed to make the correction or provide the attention, and the costs of correction or attention shall be charged against CONTRACTOR. Any action by OWNER shall not relieve CONTRACTOR of the guarantees provided in this Article or elsewhere in the Contract Documents.

F. This article does not in any way limit the guarantee on any items for which a longer guarantee is specified, or any items for which a manufacturer gives a guarantee

for a longer period. CONTRACTOR shall furnish OWNER with all appropriate guarantee or warranty certificates upon completion of the Project.

G. All guarantees required under this Article shall be considered to be in writing on the guarantee provided by CONTRACTOR, and CONTRACTOR shall use the form included in the Contract Documents unless otherwise agreed by OWNER.

H. OWNER may collect its reasonable costs and attorneys' fees in any action to enforce this Article.

ARTICLE 33 SURVEYS

OWNER shall furnish all surveys describing the physical characteristics, legal limitations, and utility locations for the site of the Project and a legal description of the site. Surveys to determine locations of construction, grading, and site work shall be provided by CONTRACTOR.

ARTICLE 34 SOILS INVESTIGATION REPORT

A. When a soils investigation report has been obtained from test holes at the site, that report is available for CONTRACTOR's use in preparing its bid and work under the Contract Documents. Any information obtained from the report or any information given on drawings as to subsurface soil conditions or as to elevations of existing grades or elevations of underlying rock, is approximate only, is not guaranteed, and **is not part of the Contract Documents**. CONTRACTOR is required to make a visual examination of the site and must make whatever tests it deems appropriate to determine the actual underground condition of the soil.

B. CONTRACTOR agrees that it will make no claim against OWNER for damages in the event that during progress of the Work, CONTRACTOR encounters subsurface or latent conditions at the site materially different from those shown on drawings or indicated in Specifications or soils reports, or for unknown conditions of an unusual nature which differ materially from those ordinarily encountered in work of the type provided for in the Plans and Specifications.

C. If during the course of work under the Contract Documents CONTRACTOR encounters subsurface or latent conditions which differ materially from those indicated in the soils investigation report, or drawings, or Specifications, CONTRACTOR shall notify OWNER of same within five working days of discovery of the condition.

WARNING: OWNER does not warrant the soils at the project site. A soils investigation report is provided for CONTRACTOR'S information only. CONTRACTOR represents it has conducted an independent investigation of the project site and the soil conditions of the site. CONTRACTOR is solely

responsible to ascertain site conditions for the purposes of determining construction means and methods before commencing construction.

ARTICLE 35 PERMITS AND LICENSES

A. All necessary permits and licenses shall be secured and paid for by CONTRACTOR unless otherwise provided in the Contract Documents.

B. All permits, licenses, and certificates shall be delivered to the Architect before demand is made for the certificate of final payment.

C. CONTRACTOR shall, and shall require subcontractors to, maintain appropriate contractor's licenses in effect as required by law throughout the entire Project.

D. Easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by OWNER unless otherwise specified.

E. Permits and charges for installation and inspection of utility services by serving utilities shall be secured and paid for by OWNER.

ARTICLE 36 CUTTING AND PATCHING

A. CONTRACTOR shall do all cutting, fitting, or patching of the Work as required to make its several component parts come together properly, and fit it to receive or be received by any work of other contractors indicated on, or reasonable implied by, the drawings and Specifications, and shall follow all directions given by the Architect.

B. Any cost caused by defective or ill-timed work shall be borne by CONTRACTOR.

C. CONTRACTOR shall not endanger any work by cutting, excavating, or otherwise altering work, and shall not cut or alter work of any other contractor except with the written consent of the Architect.

D. CONTRACTOR shall be solely responsible for protecting existing work on adjacent properties and shall obtain all required permits for shoring and excavations near property lines.

E. When modifying existing work or installing new work adjacent to existing work, CONTRACTOR shall match the finishes, textures, and colors of the original work as closely as conditions of site and materials will allow, refinishing existing work as required, at no additional cost to OWNER.

F. CONTRACTOR is aware that this Project may be split into several phases. If the Project is split into phases, CONTRACTOR has made allowances for any delays or

damages which may arise from coordination with contractors for other phases. If any delays should arise from a contractor working on a different phase, CONTRACTOR's sole remedy for damages, including delay damages, shall be against the contractor who caused such damage and not against OWNER. CONTRACTOR shall provide access to contractors for other phases as necessary to prevent delays and damages to contractors working on other phases of construction.

ARTICLE 37 TESTS AND INSPECTIONS

A. If the Contract Documents, OWNER's instructions, laws, ordinances, or any public authority requires any work to be specially tested or approved, CONTRACTOR shall give notice, in accordance with requirements of such authority, of CONTRACTOR's readiness for observation or inspection. Such notice shall be given at least two working days prior to being tested or covered up. If inspection is by authority other than OWNER, CONTRACTOR shall inform OWNER's Inspector of the date fixed for such inspection. Required certificates of inspection shall be secured by CONTRACTOR. Observations by OWNER shall be promptly made, and where practicable, at the source of supply. If any work is covered up without approval or consent of OWNER, if required by OWNER, it must be uncovered for examination and satisfactorily reconstructed at CONTRACTOR's expense, in compliance with the Contract Documents. The cost of inspection or testing of any materials which are not in compliance with the Contract Documents shall be borne by CONTRACTOR. If the inspection or testing was paid for by OWNER, it will be charged back to and paid by CONTRACTOR. Other costs for tests and inspection of materials shall be paid by OWNER, unless otherwise provided in the Contract Documents.

B. Where the inspection and testing will be conducted by an independent laboratory or agency, the materials or samples of materials to be tested shall be selected by the laboratory or agency, or OWNER's representative, and not by CONTRACTOR.

C. CONTRACTOR shall notify OWNER in writing a sufficient time in advance of the manufacture of any materials to be supplied to CONTRACTOR under the Contract Documents, which materials must be tested according to the terms of the Contract Documents, in order that OWNER may arrange for testing at the source of supply. Materials shipped by CONTRACTOR from the source of supply without having satisfactorily passed testing and inspection, or prior to receipt of notice from OWNER that testing and inspection will not be required, shall not be incorporated into the Work without the prior approval of OWNER and subsequent testing and inspection.

D. Reexamination or retesting of questioned work may be ordered by OWNER, and if so ordered any work must be uncovered by CONTRACTOR. If the work is determined to be in accordance with the Contract Documents, OWNER shall bear the costs of reexamination or retesting and replacement. If the work is not in accordance with the Contract Documents, CONTRACTOR shall bear the costs.

ARTICLE 38 EXCAVATION DEEPER THAN FOUR FEET

A. CONTRACTOR shall provide adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life and limb in trenches and open excavation. Any such method used shall conform to applicable safety standards.

B. If the Contract Documents involve the excavation of any trench or trenches more than four feet in depth, in advance of excavation CONTRACTOR shall submit to OWNER, or to whomever OWNER designates, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches. If the plan varies from the Shoring System Standards established by the Construction Safety Orders of the Division of Industrial Safety of the Department of Industrial Relations, the plan shall be prepared by a registered civil or structural engineer employed by CONTRACTOR, and all costs of the plan shall be included in the contract price. In no case shall the plan be less effective than that required by the Construction Safety Orders. No excavation of any trench or trenches shall be commenced until the plan has been accepted by CAL-OSHA and a CAL-OSHA permit for the plan is delivered to OWNER.

C. If the Contract Documents involve digging trenches or excavations that extend deeper than four feet below the surface, the following shall apply:

1. Before the following conditions are disturbed, CONTRACTOR shall promptly notify OWNER in writing of any:

a. Material that CONTRACTOR believes may be hazardous waste, as defined in Health and Safety Code Section 25117, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

b. Subsurface or latent physical conditions at the site different from those indicated.

c. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents.

2. OWNER shall promptly investigate the conditions, and if it finds that the conditions do so materially differ, or do involve hazardous waste, and cause a decrease or increase in CONTRACTOR's cost or the time required for

performance of any part of the Work, shall issue a change order under the procedures described in the Contract Documents.

3. In the event of a dispute between OWNER and CONTRACTOR concerning whether or not the conditions materially differ or involve hazardous waste, or cause a decrease or increase in CONTRACTOR's cost or time required for performance of any part of the Work, CONTRACTOR shall not be excused from any scheduled completion date provided for by the Contract Documents, but shall proceed with all the work to be performed. CONTRACTOR shall retain any and all rights provided either by contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

ARTICLE 39 WORKERS

A. At all times, CONTRACTOR shall enforce strict discipline and good order among its employees, shall not employ any unfit person or anyone not skilled in the work assigned, and shall require the same of all subcontractors of all tiers. It shall be the responsibility of CONTRACTOR to ensure subcontractor compliance with this Article.

B. Any person in the employ of CONTRACTOR or subcontractors whom OWNER may deem to be incompetent, unfit, troublesome, or otherwise undesirable, shall be excluded from the work site and shall not again be employed on it except with written consent of OWNER.

ARTICLE 40 FINGERPRINTING WORKERS

A. CONTRACTOR shall comply with the applicable requirements of Education Code sections 45125.1 and 45125.2 with respect to fingerprinting CONTRACTOR's employees and pupil safety. CONTRACTOR shall also ensure that each of its subcontractors on the Project complies with the applicable requirements of sections 45125.1 and 45125.2. To this end, CONTRACTOR must complete and submit to OWNER the certification form included in the Contract Documents for itself and its subcontractors prior to commencing work on the Project. At CONTRACTOR's expense, CONTRACTOR shall comply with any directive from OWNER specifying measures to ensure the safety of pupils, including but not limited to one or more measures described in Education Code section 45125.2(a).

B. Should CONTRACTOR or any subcontractor feel its employees will have limited or less contact with OWNER's pupils, application shall be made to OWNER for a determination on that question. The determination by OWNER shall be final. In the event OWNER makes a determination of limited or less contact with pupils, CONTRACTOR shall comply with any directive by OWNER to ensure the safety of pupils, at CONTRACTOR's expense.

C. Use of Education Code section 45125.2(a)(1), (2), or (3) for compliance with these fingerprinting requirements is subject to prior OWNER approval. The determination by OWNER on the application of any of these sections shall be final.

D. In no event shall any employee of CONTRACTOR or its subcontractors come into contact with OWNER's pupils before the certification is completed and approved by OWNER.

ARTICLE 41 WAGE RATES AND PAYROLL RECORDS

A. Pursuant to the provisions of Article 2 (commencing at Section 1770), Chapter 1, Part 7, Division 2, of the California Labor Code, OWNER has ascertained the general prevailing rate of per diem wages for each craft, classification, or type of worker needed to execute the work of the Project in the locality in which this public work is to be performed. The general prevailing rates of per diem wages are available at OWNER's office. CONTRACTOR is responsible to pay those rates determined to be applicable by the Director of the Department of Industrial Relations and OWNER shall not be responsible for any damages arising from the error.

B. When permitted by law, holiday and overtime work shall be paid at a rate of at least one and one-half times the specified rate of per diem wages, unless otherwise specified.

C. CONTRACTOR shall pay and shall cause to be paid to each worker engaged in work on the Project not less than the general prevailing rate of per diem wages, regardless of any contractual relationship which may exist between CONTRACTOR or any Subcontractor and such workers.

D. Pursuant to Labor Code Section 1775, CONTRACTOR shall forfeit and OWNER shall withhold from payments to CONTRACTOR not more than $200 for each calendar day any worker is paid less than the established prevailing wage rates for the work or craft in which the worker is employed by CONTRACTOR on the Project. The difference between the established prevailing wage rates and the amount paid to each worker for each whole or partial calendar day for which each worker was paid less than the established prevailing wage rates shall be paid to each worker by CONTRACTOR.

E. Any worker employed to perform work on the Project which is not covered by any classification available in OWNER's office, shall be paid not less than the minimum rate of wages specified for the classification which most nearly corresponds with work to be performed by him, and that minimum wage rate shall be retroactive to the time of initial employment of the person in the classification.

F. Pursuant to Labor Code Section 1773.1, per diem wages are deemed to include employer payments for health and welfare, pension, vacation, travel, subsistence, apprenticeship, and similar purposes.

G. At appropriate conspicuous points on the site of the Project, CONTRACTOR shall post job site notices prescribed by the Department of Industrial Relations, including but not limited to, a schedule showing all determined minimum wage rates and all authorized deductions, if any, from unpaid wages actually earned.

H. CONTRACTOR shall submit a breakdown of all labor costs for this Project by trade. This breakdown shall be for all labor that CONTRACTOR or any subcontractor supplies to the Project. This information shall be provided to OWNER before the **first payment request** after the Notice to Proceed has been issued. Failure to provide the labor cost breakdown will result in delay in processing the payment request until the complete cost breakdown is provided by CONTRACTOR and received and approved by OWNER. No other labor expenses will be considered unless approved in writing by OWNER.

I. Pursuant to the provisions of Labor Code Section 1776, CONTRACTOR shall keep and shall cause each Subcontractor performing any portion of the work on the Project 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 in connection with the Work. Each payroll record shall contain or be verified by a written declaration that it is made under penalty of perjury, stating that (1) the information contained in the payroll record is true and correct, and (2) the employer has complied with the requirements of Sections 1771, 1811, and 1815 for any work performed by the employer's employees on the Project.

J. The payroll records required under this article shall be certified and shall be available for inspection at all reasonable hours at CONTRACTOR's principal office on the following basis:

1. A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request;

2. A certified copy of all required payroll records shall be made available for inspection or furnished upon request to a representative of OWNER, the Division of Labor Standards Enforcement, and/or the Division of Apprenticeship Standards of the Department of Industrial Relations;

3. A certified copy of all payroll records required under this article shall be made available for inspection or copies made upon request by the public;

provided, however, that a request by the public shall be made through either OWNER, the Division of Apprenticeship Standards, or the Department of Industrial Relations. If the requested payroll records have not been provided pursuant to Paragraph 2 above, prior to being provided the records, the requesting party shall reimburse the costs of preparation by CONTRACTOR, Subcontractors, and the entity through which the request was made. The public shall not be given access to the records at CONTRACTOR's principal office.

4. The form of certification shall be as follows:

I, _____ (*printed name*), the undersigned, am the _____ (*position in business*) with the authority to act for and on behalf of _____ (*name of business and/or CONTRACTOR*), and certify under penalty of perjury that the records or copies submitted and consisting of (*description, number of pages*) are the originals or true, full, and correct copies of the originals which depict the payroll record(s) of the actual disbursements by way of cash, check, or whatever form to the individual or individuals named.

Dated: _____ Signature:_____

K. CONTRACTOR shall file a certified copy of the required payroll records with the entity requesting the records within 10 days after receipt of a written request. In the event CONTRACTOR fails to comply within the 10-day period, as a penalty to OWNER CONTRACTOR shall forfeit $100 for each calendar day, or portion of each calendar day, for each worker until strict compliance is effectuated. Upon request by the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

L. Payroll records made available for inspection as copies and furnished upon request to the public by OWNER, the Division of Apprenticeship Standards, or the Division of Labor Standards Enforcement shall be marked or obliterated to prevent disclosure of an individual's name, address, and social security number. Payroll records furnished to agencies that are included in the Joint Enforcement Strike Force on the Underground Economy and other law enforcement agencies investigating violations of law shall be unredacted. The name and address of CONTRACTOR shall not be marked or obliterated in either case.

M. CONTRACTOR shall inform OWNER of the location of the payroll records, including the street address, city, and county, and within five working days shall provide a written notice of a change of location and address.

N. It shall be CONTRACTOR's responsibility to ensure compliance with the provisions of this article and the provisions of Labor Code Section 1776.

O. This project is subject to prevailing wage monitoring and enforcement by the Department of Industrial Relations. CONTRACTOR and all subcontractors shall be subject to the requirements of Subchapter 4.5 of Chapter 8 of Title 8 of the California Code of Regulations. Contractor and all subcontractors must furnish electronic certified payroll records to the DIR on the frequency specified in the Notice Calling for Bids using the DIR's eCPR system. To enroll in the eCPR system or obtain additional information and assistance, CONTRACTOR is directed to the DIR website at www.dir.ca.gov/Public-Works/Certified-Payroll-Reporting.html. CONTRACTOR shall comply with all requirements of the Labor Code and attendant regulations pertaining to prevailing wage monitoring and compliance as indicated in the Contract Documents, and/or as required by the DIR. CONTRACTOR shall permit OWNER, the DIR or their designee to interview CONTRACTOR's employees concerning compliance with prevailing wage, apprenticeship, and related matters, whether or not during work hours, and shall require each subcontractor to provide OWNER, the DIR or their designee with such access to its employees.

ARTICLE 42 APPRENTICES

A. CONTRACTOR acknowledges and agrees that the Contract Documents are governed by the provisions of Labor Code Section 1777.5 where applicable. It shall be CONTRACTOR's responsibility to ensure compliance with this article and with Labor Code Section 1777.5 for all apprenticing occupations.

B. Apprentices of any crafts or trades may be employed, and when required by Labor Code Section 1777.5, shall be employed provided they are properly registered in full compliance with the provisions of the Labor Code.

C. Every apprentice shall be paid the prevailing rate of per diem wages for apprentices in the trade to which the apprentice is registered, and shall be employed only at the work of the craft or trade to which the apprentice is registered.

D. Only apprentices as defined in Labor Code Section 3077 who are in training under apprenticeship standards that have been approved by the Chief of the Division of Apprenticeship Standards, and who are parties to written apprentice agreements under Chapter 4 (commencing at Section 3070), Division 3, of the Labor Code, are eligible to be employed on public works. The employment and training of each apprentice shall be in accordance with either (1) the apprenticeship standards and apprentice agreements under which the apprentice is in training, or (2) the rules and regulations of the California Apprenticeship Council.

E. Pursuant to Labor Code Section 1777.5, CONTRACTOR and any subcontractors employing workers in any apprenticeship craft or trade performing any work under the Contract Documents shall employ apprentices in at least the ratio set forth in Labor Code Section 1777.5, and may apply to any apprenticeship program in the craft or trade

that can provide apprentices to the project site for a certificate approving CONTRACTOR or Subcontractor under the applicable apprenticeship standards for the employment and training of apprentices in the area of industry affected.

F. Prior to commencing work on the Project, CONTRACTOR shall submit contract award information to an applicable apprenticeship program that can supply apprentices to the project site. The information submitted shall include an estimate of journeyman hours to be performed on the Project, the number of apprentices proposed to be employed, and the approximate dates the apprentices would be employed. A copy of this information shall also be submitted to OWNER if requested. Within 60 days after concluding work on the Project, CONTRACTOR and all Subcontractors shall submit a verified statement of the journeyman and apprentice hours performed on the Project to the awarding body, if requested, and to the apprenticeship program. This information shall be public.

G. If in performing any of the Work, CONTRACTOR employs journeymen or apprentices in any apprenticeable craft or trade, CONTRACTOR shall contribute to the California Apprenticeship Council the same amount that the Director of Industrial Relations determines is the prevailing amount of apprenticeship training contributions in the area of the Project, subject to any credits permitted by law.

H. If CONTRACTOR or any Subcontractor is determined by the Chief of the Division of Apprenticeship Standards to have knowingly violated Labor Code Section 1777.5, it shall:

1. Forfeit as a civil penalty an amount not exceeding $100 ($300 for knowing subsequent violations) for each full calendar day of noncompliance. Notwithstanding Labor Code Section 1727, upon receipt of a determination that a civil penalty has been imposed by the Labor Commissioner, OWNER shall withhold the amount of the civil penalty from contract progress payments then due or to become due.

2. In lieu of the monetary penalty, for a first-time violation and with the concurrence of a specified apprenticeship program, the Labor Commissioner may order CONTRACTOR or any Subcontractor to provide apprentice employment equivalent to the work hours that would have been provided for apprentices during the period of noncompliance.

3. In the event CONTRACTOR or any Subcontractor is determined by the Labor Commissioner to have knowingly committed a serious violation of any provision of Section 1777.5, the Labor Commissioner may also deny CONTRACTOR or any Subcontractor, and their responsible officers, the right to bid on or be awarded or perform work as a subcontractor on any public works

contract for a period of up to one year for the first violation and up to three years for a subsequent violation.

CONTRACTOR or any Subcontractor (or responsible officer) shall have the right to obtain a review of the determination imposing a debarment or civil penalty as provided by law.

I. CONTRACTOR and all Subcontractors shall comply with Labor Code Section 1777.6, which forbids certain discriminatory practices in the employment of apprentices.

J. CONTRACTOR shall become fully acquainted with the law regarding apprentices prior to commencement of the work. Special attention is directed to Labor Code Sections 1777.5, 1777.6, and 1777.7, and Title 8, California Code of Regulations, Section 200 et seq. Questions may be directed to the State Division of Apprenticeship Standards, 455 Golden Gate Avenue, San Francisco, California.

ARTICLE 43 HOURS OF WORK

A. CONTRACTOR shall furnish, and shall require all Subcontractors to furnish, sufficient forces to ensure the Work is prosecuted in accordance with the detailed project schedule without payment of overtime wage rates whenever possible.

B. As provided in Article 3 (commencing at Section 1810), Chapter 1, Part 7, Division 2 of the Labor Code, eight hours of labor shall constitute a legal day of work. The time of service of any worker employed at any time by CONTRACTOR, or by any subcontractor, upon the Work or upon any part of the work contemplated by the Contract Documents is limited and restricted to eight hours per day and 40 hours during any one week. Upon completion of all hours worked in excess of eight hours per day, work shall be permitted upon this Project at not less than one and one-half times the basic rate of pay.

C. CONTRACTOR shall keep, and shall cause all subcontractors to keep, an accurate record showing the name and actual hours worked each calendar day and each calendar week by each worker employed in connection with the Work or any part of the Work contemplated by the Contract Documents. The record shall be kept open at all reasonable hours to the inspection of OWNER and to the Division of Labor Standards Enforcement, Department of Industrial Relations.

D. Saturdays, Sundays, holidays (including all OWNER designated holidays), and any day with work hours before 7:30 a.m. and/or after 4 p.m. shall be considered overtime for OWNER’s representatives, consultants, and inspectors, and shall be compensated as such by CONTRACTOR per OWNER’s submitted invoice. Such cost shall be billed to CONTRACTOR and deducted from subsequent progress payments or the final payment.

E. As a penalty, CONTRACTOR shall pay $25 to the Department of Industrial Relations or OWNER for each worker employed by CONTRACTOR or by any subcontractor in the performance of the Contract Documents for each calendar day during which the worker is required or permitted to work more than eight hours in any calendar day and 40 hours in any one calendar week in violation of the provisions of Article 3 (commencing at Section 1810), Chapter 1, Part 7, Division 2 of the Labor Code.

F. Any work performed before or after regular working hours or on Saturdays, Sundays, or holidays (including all OWNER designated holidays) shall be performed without additional expense to OWNER. Should inspection or testing services be necessary on a Saturday, Sunday, or holiday (including all OWNER designated holidays), CONTRACTOR shall pay all additional expenses incurred. Such cost shall be billed to CONTRACTOR and deducted from the next payment.

G. CONTRACTOR shall anticipate work that would occur outside the normal work hours of 7:30 a.m. to 4 p.m. Such activities would include but are not limited to early morning concrete pours (because of hot weather), early or late material deliveries, required off-site inspections, or any other activity that would require the Project Inspector or OWNER personnel to work longer than an eight-hour day.

H. The Project Inspector cannot be asked to leave the Project after eight hours of work so CONTRACTOR would not have to pay overtime. If the extended work day is a result of CONTRACTOR'S work, the Project Inspector will perform its DSA assigned work as necessary to assure the Project is kept on schedule and CONTRACTOR is responsible to pay all costs associated with fulfilling these DSA assignments, including the Project Inspector's overtime. These costs shall be billed to CONTRACTOR and deducted from subsequent progress payments or the final payment.

ARTICLE 44 NONDISCRIMINATION

In the performance of the terms of the Contract Documents, CONTRACTOR agrees that it will not engage in or permit any Subcontractor it may employ to engage in unlawful discrimination in employment of persons because of the race, religious creed, color, national origin, ancestry, physical handicap, medical condition, marital status, or sex of such persons.

ARTICLE 45 COST BREAKDOWN AND PERIODICAL ESTIMATES

A. On forms approved by OWNER, CONTRACTOR shall furnish the following:

1. Within 10 calendar days of award of contract, a detailed estimate giving a complete breakdown of contract price for each Project or site, which shall include

all Subcontractor/supplier agreements showing dollar amounts of these agreements to justify the schedule of values; and

2. A periodical itemized estimate of work done for the purpose of making partial payments; and

3. A schedule of estimated monthly payments due CONTRACTOR within 10 days of request by OWNER.

B. Values employed in making up any of these schedules are subject to the Architect's written approval and will be used only for determining basis of partial payments and will not be considered as fixing a basis for additions to or deductions from contract price unless OWNER in its sole discretion so elects.

ARTICLE 46 PAYMENTS

A. Unless otherwise specified in writing, each month within 30 days after receipt by OWNER of the monthly progress schedule and the certification of application for payment by the Architect, OWNER shall pay to CONTRACTOR a sum equal to 95 percent of the value of work performed and materials delivered subject to or under the control of OWNER and unused up to the last day of the previous month, less aggregate previous payments. In its sole discretion, OWNER may also deduct from these payments any amounts deemed due from CONTRACTOR.

B. Monthly payments shall be made only on the basis of monthly estimates which shall be prepared by CONTRACTOR on a form approved by OWNER and filed before the fifth day of the month during which payment is to be made.

C. Before consideration of a request for payment, a certificate in writing shall be obtained from the Architect stating that the work for which the payment is demanded has been performed in accordance with the terms of the Contract Documents and that the amount stated in the certificate is due under the terms of the Contract Documents. The certificate shall be attached to and made a part of the payment request filed with OWNER. The certificate of the Architect shall not be conclusive upon OWNER, but advisory only.

D. If within three days after written demand the Architect fails to deliver such certificate, CONTRACTOR may file its payment request with OWNER without the certificate, but the request shall be accompanied by a statement that demand was made for the certificate and was refused. OWNER will then either allow the payment request as presented or shall by an order entered on the minutes of OWNER state the reasons for refusing to make payment.

E. Work completed as estimated shall be an estimate only and no inaccuracy or error in an estimate shall operate to release CONTRACTOR or Surety from any damages arising from such work or from enforcing each and every provision of the Contract Documents, and OWNER shall have the right to subsequently correct any error made in any estimate for payment.

F. CONTRACTOR SHALL NOT BE ENTITLED TO HAVE ANY PAYMENT REQUESTS PROCESSED OR ANY PAYMENT FOR WORK PERFORMED SO LONG AS CONTRACTOR HAS FAILED TO COMPLY WITH ANY LAWFUL OR PROPER DIRECTION CONCERNING THE WHOLE OR ANY PORTION OF THE WORK GIVEN BY OWNER OR THE ARCHITECT.

G. OWNER has discretion to require from CONTRACTOR any of the following information with the application for payment: (1) certified payroll covering the period of the prior application for payment, (2) unconditional waivers and releases from all Subcontractors/suppliers for which payment was requested under the prior application for payment, (3) receipts or bills of sale for any items. In addition, upon submittal of the first payment request, a complete per diem wage rate breakdown for all trades must be submitted in order for the payment request to be processed.

H. PAYMENT BY OWNER OF ANY PAYMENT REQUEST IS NOT AN INDICATION THAT OWNER HAS INSPECTED, APPROVED, OR ACCEPTED ANY PART OF THE WORK, NOR SHALL PAYMENT CONSTITUTE A WAIVER IN ANY RESPECT OF ANY OWNER RIGHTS.

I. The final payment of 5 percent of the value of the work done under the Contract Documents, if unencumbered, may be made 35 days after the Notice of Completion is recorded by OWNER. ACCEPTANCE WILL BE MADE ONLY BY ACTION OF THE GOVERNING BOARD OR OTHER GOVERNING BODY OF OWNER IN ACCORDANCE WITH THE PROVISIONS ON “COMPLETION.”

J. Unless otherwise agreed in writing, on or before making request for final payment of the undisputed amount due under the Contract Documents, CONTRACTOR shall submit to OWNER the following in writing:

1. Information on CONTRACTOR’s results in attaining compliance with the OWNER’s three percent participation goal for Disabled Veterans Business Enterprises;

2. A summary of all claims for compensation under or arising out of the Contract Documents, stating whether the claims are settled or unsettled and the amounts of the claims, and further specifying the date(s) upon which any required protest and/or notice was given to OWNER;

3. A written release of all claims against OWNER arising by virtue of the Project, the Work, and the Contract Documents. Payment of undisputed amounts is contingent upon receipt of this waiver.

ARTICLE 47 PAYMENTS BY CONTRACTOR

CONTRACTOR shall pay:

A. All transportation and utility services not later than the 20th day of the calendar month following the month in which the services are rendered;

B. Ninety-five percent of the cost of all materials, tools, and other expendable equipment, not later than the 20th day of the calendar month following the month in which the materials, tools, and equipment are delivered to the project site, and the balance of the cost not later than the 30th day following completion of that part of the work in which the materials, tools, and equipment are incorporated or used; and

C. To each of its subcontractors the respective amounts allowed CONTRACTOR on account of work performed by each subcontractor not later than the fifth day following each payment to CONTRACTOR.

ARTICLE 48 PAYMENTS WITHHELD

A. In addition to any amount(s) which OWNER may retain under the article entitled "PAYMENTS," OWNER may withhold sufficient amount(s) of any payment(s) otherwise due to CONTRACTOR, as in its judgment may be necessary to cover the following:

1. Payments which may be past due and payable for claims against CONTRACTOR or any Subcontractors at any level for labor or materials furnished in the performance of work under the Contract Documents.

2. Defective work not remedied.

3. Failure of CONTRACTOR to make proper payments to its subcontractor(s) or material suppliers for materials or labor.

4. Completion of work if there exists a reasonable doubt that the work can be completed for the balance then unpaid.

5. Damage to another contractor.

6. All costs and expenses associated with OWNER having to acquire alternate educational facilities if CONTRACTOR fails to complete the Project within the period of time required by the Contract Documents.

7. Project schedule not up-to-date with the current payment request.

8. Overtime charges due consultants, Project Inspectors, the Architect, and OWNER or others as a result of extra services that were provided at CONTRACTOR's request or as a result of actions of CONTRACTOR or those employed by CONTRACTOR, including subcontractors, material suppliers, or others will be withheld from current payment requests.

9. CONTRACTOR agrees that OWNER may withhold 150 percent of the estimated cost of any additional testing or retesting required as a result of the fault or negligence of CONTRACTOR, or Subcontractors, vendors, or suppliers, until such time as OWNER receives confirmation that payment for such additional testing or retesting has been made.

10. Failure to maintain a current record set of drawings. The drawings shall be updated to the date when the payment request is submitted.

11. Failure to submit daily reports.

12. Failure to submit items required to accompany payment requests at initial and final completion.

13. Failure to submit and keep current any construction schedule required by the Contract Documents.

14. Failure to compensate the Architect for substitution review within the required time period.

15. Failure to compensate OWNER for overtime charges for OWNER representatives and employees incurred as a result of services provided during the current payment period.

16. Failure to compensate OWNER and/or the Architect for the cost of review time to evaluate CONTRACTOR'S proposed solutions to effect repair of work not in accordance with Contract Documents.

17. Failure to submit per diem wage rates for all trades pursuant to appropriate provisions of the General Conditions.

18. Penalties for violation of labor laws.

19. Cost of site clean-up.

20. Required payments to indemnify, hold harmless, or defend OWNER.

21. Compensation for unpaid extra services for the Architect caused by CONTRACTOR.

22. Compensation for unpaid extra services for the Project Inspector, including but not limited to reinspection required due to CONTRACTOR's failed tests, installation of unapproved or defective materials, or CONTRACTOR's requests for inspection and failure to attend the requested inspection.

23. Any liquidated damages, forfeiture of fees, or other damages assessed against CONTRACTOR by reason of failure to complete the Project on time.

B. OWNER may apply the withheld amount(s) to the payment of any claims or obligations at its discretion. In so doing, OWNER shall be deemed the agent of CONTRACTOR and any payment made by OWNER shall be considered to be a payment made under the Contract Documents by OWNER to CONTRACTOR, and OWNER shall not be liable to CONTRACTOR for the payments made in good faith. The payments may be made without prior judicial determination of the claim or obligations. OWNER shall submit to CONTRACTOR an accounting of the funds disbursed on behalf of CONTRACTOR.

ARTICLE 49 SUBSTITUTION OF SECURITIES

A. Pursuant to the provisions of Public Contract Code section 22300, CONTRACTOR may substitute certain securities for any funds withheld by OWNER to ensure its performance under the Contract Documents. At the request and expense of CONTRACTOR, securities equivalent to any amount withheld shall be deposited, at the discretion of OWNER, with either a state or federally chartered bank as the escrow agent, who shall then pay any funds otherwise subject to retention to CONTRACTOR. Upon satisfactory completion of the Project, the securities shall be returned to CONTRACTOR.

B. Securities eligible for investment under this article shall include those listed in Government Code section 16430, bank and savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by CONTRACTOR and OWNER.

C. CONTRACTOR shall be the beneficial owner of any securities substituted for funds withheld and shall receive any interest.

D. All expenses relating to the substitution of securities under Public Contract Code section 22300 and this article, including but not limited to OWNER's overhead and administrative expenses and expenses of escrow agent, shall be CONTRACTOR's responsibility.

E. Should the value of the substituted security at any time fall below the amount for which it was substituted, or any other amount which OWNER determines to withhold, CONTRACTOR shall immediately and at CONTRACTOR'S expense deposit additional security qualifying under Public Contract Code section 22300 until the total security deposited is no less than equivalent to the amount subject to withholding under the Contract Documents.

F. In the alternative, under Public Contract Code section 22300, at its own expense, CONTRACTOR may request OWNER to make payment of earned retention funds directly to the escrow agent.

G. All escrow agreements shall be in conformance with the Escrow Agreement for Security Deposits in Lieu of Retention set forth in Public Contract Code section 22300, and shall be in the form of agreement provided by OWNER unless otherwise agreed in advance.

ARTICLE 50 PROGRESS SCHEDULE

A. Immediately after being awarded the Construction Agreement, CONTRACTOR shall prepare an estimated progress schedule and submit it to OWNER for review. The schedule shall indicate the beginning and completion dates of all phases of construction.

B. The schedule shall be updated at reasonably required intervals throughout the Project, unless specifically required to be updated at more frequent intervals.

C. Additional scheduling requirements may be contained in the attached Supplemental General Conditions.

D. While OWNER does not discourage efforts by CONTRACTOR to accomplish an early completion of the Project, CONTRACTOR is directed to utilize and schedule the entire construction period set forth in the Construction Agreement. Any portion of the construction period not so scheduled shall be considered “float” and used the same as other float under the Contract Documents.

ARTICLE 51 EXTENSION OF TIME—LIQUIDATED DAMAGES

A. The parties understand and agree that the goodwill, educational process, and other business of OWNER will be damaged if the Project is not completed within the time limits required. The parties have further agreed that the exact amount of damages for failure to complete the Work within the time specified is, in some cases, extremely difficult, impractical, or impossible to determine. As to those damages that are difficult, impractical, or impossible to determine, CONTRACTOR shall be assessed the sum set

forth in the Contract Documents per day as liquidated damages for each and every calendar day until the work required under the Contract Documents is complete. CONTRACTOR will pay to OWNER or OWNER may retain such damages from amounts otherwise payable to CONTRACTOR. For purposes of this article, the Work shall be considered "complete" in accordance with the provisions of the article on "COMPLETION," except that the work may be considered compete without formal acceptance by the OWNER's governing board or other governing body so long as the governing board, at its next regularly scheduled meeting, accepts the work.

B. Providing CONTRACTOR has protested and/or given notice of delays on the Project as required by these Contract Documents, CONTRACTOR shall not be charged for liquidated damages as set forth above because of any delays in completion of work which are not the fault or negligence of CONTRACTOR, including but not restricted to acts of God. CONTRACTOR shall provide documentation and justification to substantiate the delay and its relation to the Project's critical path. OWNER shall ascertain the facts and extent of delay and grant extension of time for completing work when, in its judgment, the facts justify an extension. OWNER's findings of fact shall be final and conclusive on the parties. Extension of time shall apply only to that portion of work affected by the delay, and shall not apply to other portions of work not so affected. Any dispute pertaining to a request for time or assessment of liquidated damages shall be resolved pursuant to the provisions on resolution of construction claims in the Contract Documents.

C. In addition to any liquidated damages which may be assessed, if CONTRACTOR fails to complete the Project within the time period provided in the Contract Documents, and if as a result OWNER finds it necessary to incur any costs and/or expenses, or if OWNER receives any claims by other contractors, subcontractors, or third parties claiming time or other compensation by reason of CONTRACTOR's failure to complete work on time, CONTRACTOR shall pay all those costs and expenses incurred by OWNER. These costs and expenses may include but are not limited to such items as rental payments, inspection fees, and additional architectural fees, whether related to the acquisition of facilities or caused by the delay in completion. These costs and expenses may be retained by OWNER from any payments otherwise due to CONTRACTOR.

D. Within 10 days of the beginning of any delay (unless OWNER grants in writing a further period of time to file notice prior to the date of final completion of the Project), CONTRACTOR shall notify OWNER in writing of the causes for the delay. Failure to give the required notice in writing within the time provided shall be interpreted as a failure by CONTRACTOR to properly administer the Contract Documents, Project, and Work, and shall constitute a waiver by CONTRACTOR of all claims of any kind and nature, without limitation, arising from the delay. In addition to this notice, in any instance where CONTRACTOR claims delay was caused by OWNER, the Architect or Architect's consultants, Inspector of Record, Division of State Architect, or anyone

claimed to be an agent of them, and as a precondition to any right to claim additional time, prior to making any request for time, CONTRACTOR shall have satisfied the obligation of the Contract Documents to protest the delay.

E. Extensions of time shall be based solely upon the effect of delays to the work as a whole and will not be granted unless CONTRACTOR can demonstrate through analysis of the current updated schedule that the delay was caused by one of the causes for which an extension is authorized. A time extension will not be granted unless CONTRACTOR submits a Time Impact Analysis which utilizes networking techniques (fragments) and a written analysis of the facts which are alleged to have caused the delay. Time extensions will not be allowed for delays to parts of the work not on the critical path of the currently approved monthly updated construction schedule. Time extensions will not be granted until all available float, slack, or contingency time on the Project is used and the end date of the Work is moved beyond the current adjusted contract completion date. CONTRACTOR's sole remedy for delay or extensions of time in all cases except those due to unanticipated or unreasonable delay caused by OWNER shall be an extension of the contract time at no cost to OWNER. Additional scheduling requirements in cases of delay or requests for time may be included in supplementary conditions.

ARTICLE 52 OCCUPANCY

OWNER reserves the right to occupy buildings and/or portions of the site at any time before completion, and occupancy shall not constitute final acceptance of any part of the Work covered by the Contract Documents, nor shall such occupancy extend the date specified for completion of the Work. Beneficial occupancy of building(s) does not commence any warranty period or entitle CONTRACTOR to any additional compensation due to such occupancy, or affect in any way or amount CONTRACTOR's obligation to pay liquidated damages for failure to complete the Project on time.

ARTICLE 53 CONTRACT CLOSEOUT

A. Utility Connections: The building and/or buildings shall be connected to water, gas, sewer, and electric services, complete and ready for use. Service connections shall be made and existing services reconnected.

B. Record Drawings:

1. CONTRACTOR shall keep the following:

a. One complete set of blue line prints of all drawings which form a part of the Project in good order and available on the job site. They shall be used only for the purpose intended. Drawings shall be kept up-to-date as the Work progresses and shall be available at all times for inspection.

b. One set of annotated Specifications reflecting any and all changes to the original documents from change orders, substitutions, or any other deviations from the original specifications.

2. The intent of this procedure is to obtain an exact "as built" record of the work upon completion of the Project. The following information shall be carefully and correctly drawn on the prints and all items shall be accurately located and dimensioned from finished surfaces of building walls on all record drawings:

a. Any work not installed as indicated on drawings.

b. The exact locations and elevations of all covered utilities, including valves, cleanouts, etc.

3. CONTRACTOR shall certify to OWNER the accuracy of the record drawings and annotated Specifications and is liable and responsible for inaccuracies in as-built and/or record drawings and the annotated Specifications, even if they do not become evident until a future date.

4. Upon completion of the Work and correction of all punch list items and as a condition precedent to approval of final payment, CONTRACTOR shall obtain the Architect's review of the marked up record set of prints and annotated Specifications and employ an appropriately trained individual to transfer the as-built information to a form of electronic media, acceptable to the Architect and OWNER, containing the original Drawings. CONTRACTOR shall provide the electronic as-built drawings to the Architect. When as-built information has been transferred to the acceptable electronic medium and the record drawings have been reviewed by the Architect, CONTRACTOR shall pay for a duplicate set of contract drawings to be used for CONTRACTOR's record drawings. Those final corrected record drawings shall also be saved on electronic media, in a format designated by OWNER, and shall be given to OWNER. Reproduction expenses for the drawings shall be paid for by CONTRACTOR out of the allowance and any difference returned to OWNER.

5. CONTRACTOR shall deliver to the Architect three complete sets of operating manuals, repair parts lists, and service instructions for all electrical and mechanical equipment, together with equipment warranties.

C. Maintenance Manuals: At least 30 days prior to final inspection, three copies of complete operational and maintenance manuals shall be submitted for review. All installation, operating, and maintenance information and drawings shall be bound in 8½ x 11" binders, indexed with tabs, and include tables of contents. Each manual shall also contain a list of subcontractors, with their addresses and the names of persons to

contact in case of emergencies. Identifying labels shall provide names of manufacturers, their addresses, ratings, and capacities of equipment and machinery.

D. Inspection Requirements:

1. Before calling for final inspection, CONTRACTOR shall determine that the following work has been performed:

a. General construction has been completed;

b. Mechanical and electrical work complete, fixtures in place, connected and ready for tryout and test;

c. Electrical circuits scheduled in panels and disconnect switches labeled;

d. Painting and special finishes complete;

e. Doors complete with hardware, cleaned of protective film, in good working order without sticking or binding;

f. Tops and bottoms of doors stained/painted and sealed;

g. Floors waxed and polished as specified;

h. Broken glass replaced and glass cleaned;

i. Grounds cleared of CONTRACTOR'S equipment, raked clean of debris, and trash removed from site;

j. Work cleaned, free of stains, scratches, and other foreign matter, replacement of damaged and broken material;

k. Finished and decorative work shall have marks, dirt, and superfluous labels removed;

l. All flatwork shall have all stains removed including but not limited to oil, gas, rust, paint, etc.

2. Final inspection will be made by the Architect and specified OWNER personnel upon written notification from CONTRACTOR that work has been completed. CONTRACTOR must prearrange a final inspection with OWNER and Project Inspector. There should be a minimum of seven days' notice to OWNER and Project Inspector before the final inspection is scheduled. CONTRACTOR

shall receive a list (punch list) of items found unacceptable and shall promptly correct them. Upon written notification from CONTRACTOR that all items have been corrected the Architect and Project Inspector or OWNER will reinspect for final acceptance of the Project. Failure of CONTRACTOR to complete punch list items will necessitate further reinspection by the Architect and Project Inspector or OWNER. Cost of reinspection will be deducted from the amounts owing to CONTRACTOR.

3. Deliver keys (labeled) to OWNER's representative. Master keys shall be accounted for in writing.

4. Furnish a letter to OWNER stating that a responsible representative of OWNER (give name and position) has been instructed in working characteristics of mechanical and electrical equipment.

E. Guarantee: Upon completion of final inspection, CONTRACTOR is to submit the guarantee to OWNER as specified in the Contract Documents.

F. Manufacturer Warranties: CONTRACTOR shall deliver 10 days prior to final inspection, original manufacturer warranties for all materials, equipment and/or supplies purchased and/or installed under the Contract Documents.

G. Equipment Training: Prior to final inspection, CONTRACTOR is responsible for providing the appropriate training for a minimum of two personnel of OWNER for each trade for the newly installed mechanical and electrical equipment required under the Contract Documents.

H. Contract Closeout Items Specified Within this Article are Mandatory: The parties agree that, should the required items not be furnished to OWNER, as stated or within 30 days of completion of all other work, OWNER will suffer damage which damage will be difficult, impossible or impractical to assess. For that reason, in accordance with Government Code Section 53069.85, the parties agree the following sums shall be assessed as fixed and liquidated damages and not as a penalty:

1. Record Drawings—$25,000 or 10 percent of contract price, whichever is less;

2. Maintenance Manuals—$5,000 or 10 percent of contract price, whichever is less;

3. Guarantee—$25,000 or 10 percent of contract price whichever is greater;

4. Manufacturer Warranties—$5,000 for each product or 10 percent of contract price whichever is greater;

5. Equipment Training—$10,000 for each system or 10 percent of contract price whichever is greater.

I. In addition, the Notice of Completion will not be filed until either such amounts are paid or the items are provided. However, OWNER may also elect to file the Notice of Completion and pay retention after deducting such amounts. If CONTRACTOR disputes the amounts or OWNER's right to withhold these amounts, OWNER may withhold up to 150 percent of the disputed amount.

ARTICLE 54 COMPLETION

A. OWNER shall accept the completion of the Project when all of the following conditions have been met:

1. The entire Work or Project (including all phases if a project is phased) including minor corrective items is completed to the satisfaction of OWNER;

2. The final DSA report has been filed with the State;

3. By action of its governing board or other governing body, OWNER has accepted the Project to be complete.

4. The Notice of Completion for the entire Project has been filed and recorded.

B. A final walk-through of the Project to determine completion of the Work and to record the Notice of Completion shall occur only upon a valid claim by CONTRACTOR that the Project is complete, including minor corrective items.

1. CONTRACTOR's Project Manager and Superintendent(s) shall attend the final walk-through. A representative(s) of OWNER shall also attend.

2. Should OWNER incur any costs by reason of an erroneous or premature claim of completion by CONTRACTOR that results in a premature walk-through, OWNER may withhold such costs from any money due or to become due to CONTRACTOR.

3. Any incomplete or corrective items shall be identified in the final walk-through of the Project.

4. Incomplete and corrective items identified in any walk-through shall be completed before CONTRACTOR calls for a subsequent walk-through, which

shall be treated as and bear the same consequences as the initial call for a walk-through.

C. Alternative Process: OWNER shall have the option in its sole discretion to accept completion of the Work and have the Notice of Completion recorded when the entire Work is completed to OWNER's satisfaction, except for minor corrective items as distinguished from incomplete items.

1. Should OWNER elect to accept the Work as complete prior to completion of the entire Work or Project, it shall be on the following conditions:

a. The entire Work or Project (including all phases if a project is phased), excluding minor corrective items, is complete to OWNER's satisfaction;

b. The final DSA report shall be filed with the State as soon as appropriate;

c. By action of its governing board or other governing body, OWNER has accepted the Project to be complete.

d. The Notice of Completion for the entire project has been filed and recorded.

2. Should OWNER elect to accept the Work as complete prior to completion of the entire Work or Project, there shall be a final walk-through of the Project, as follows:

a. Final walk-through shall be made upon a valid claim by CONTRACTOR that the Project is complete, excepting only minor corrective items;

b. CONTRACTOR's Project Manager and Superintendent(s) shall attend the final walk-through. OWNER may be represented by anyone designated by OWNER's Representative, including but not limited to the Project Inspector, management, and/or representatives from Maintenance and Operations;

c. Should OWNER incur any costs by reason of an erroneous or premature claim of completion by CONTRACTOR that results in a premature walk-through, OWNER may withhold such costs from any money due or to become due to CONTRACTOR.

d. All remaining work, including minor incomplete or corrective items, shall be identified in the final walk-through of the Project;

e. Incomplete and corrective items identified in any walk-through shall be completed before CONTRACTOR calls for a subsequent walk-through, which shall be treated as, and bear the same consequences as, the initial call for a walk-through.

3. Should OWNER elect to accept the Work as complete prior to completion of the entire Work or Project, and if CONTRACTOR fails to complete the minor corrective items prior to the expiration of a 35-day period immediately following recording of the Notice of Completion, OWNER shall withhold from the final payment an amount equal to 150 percent of the estimated cost, as determined by OWNER, of each incomplete or corrective item until such time as the item is completed.

4. If at the end of an additional 30-day period, there are items remaining to be corrected, OWNER may elect to:

a. Permit additional time for completion;

b. Complete the Work at the expense of CONTRACTOR, deducting the cost of work from any amounts being withheld.

5. CONTRACTOR shall have no claim or offset as against OWNER arising or in any way connected with an election by OWNER not to accept completion of the Work until the entire Work or Project, including minor corrective items, has been completed to OWNER's satisfaction. The time taken by CONTRACTOR to complete the Work or Project, including minor corrective items, shall be a basis for assessment of liquidated damages as provided in the Contract Documents, and is not affected by any decision by OWNER to occupy all or any portion of the Work prior to completion.

ARTICLE 55 CLAIMS FOR DAMAGES

A. Pursuant to Public Contract Code section 9204, CONTRACTOR shall make all claims for payment for 1) work done by or on behalf of contractor for which payment is not otherwise expressly provided for in the Contract, 2) damages allegedly sustained by reason of any acts or omissions of OWNER or its agents, 3) time extensions, 4) relief from damages or penalties for delay or, 5) an amount disputed by OWNER by registered mail or certified mail, return receipt requested. Such written claim shall be submitted, within 10 days after the claim has arisen, is discovered or reasonably should have been discovered. CONTRACTOR shall furnish reasonable documentation to support the claim.

IF CONTRACTOR FAILS TO COMPLY WITH ANY OF THE PROVISIONS OF THIS ARTICLE CONCERNING THE SUBMISSION OF CLAIMS, ITS CLAIM(S) SHALL BE FORFEITED AND INVALIDATED.

B. In no event shall CONTRACTOR be permitted to reserve rights to make or pursue claims of any kind, whether for compensation in any form, or for time extensions, without the OWNER's express written consent. Any attempt to make such reservation or otherwise avoid the effect of this Article shall be void and of no force or effect whatsoever.

C. Any change order executed by CONTRACTOR with such reservation or other language of qualified acceptance shall be read and interpreted as though such language did not exist. No action by OWNER is required to invalidate such language, and no oral communication or other act or omission by OWNER or anyone acting on OWNER's behalf, except OWNER's express written consent, shall be construed as acquiescence in or consent to such reservation or other qualified acceptance language.

D. CONTRACTOR shall diligently proceed with performance of the Work, and OWNER shall continue to make payment of undisputed amounts, during any time period while claims are pending.

ARTICLE 56 RESOLUTION OF CONSTRUCTION CLAIMS

A. Upon receipt of a claim, OWNER shall conduct a reasonable review of the claim, and, unless extended by mutual agreement of the parties, provide CONTRACTOR a written statement identifying what portion of the claim is disputed and what portion is undisputed within 45 days.

B. If OWNER needs approval from its governing body to provide CONTRACTOR a written statement identifying the disputed portion and the undisputed portion of the claim, and OWNER'S 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, OWNER shall have up to three days following the next duly publicly noticed meeting of its governing body after the 45-day period, or extension, expires to provide CONTRACTOR a written statement identifying the disputed portion and the undisputed portion.

C. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after OWNER issues its written statement. If OWNER fails to issue a written statement, paragraph H. (below) shall apply.

D. If CONTRACTOR disputes OWNER'S written response, or if OWNER fails to respond to a claim issued pursuant to this section within the time prescribed,

CONTRACTOR 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, OWNER shall schedule a meet and confer conference within 30 days for settlement of the dispute.

E. 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, OWNER shall provide CONTRACTOR 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 OWNER issues its written statement. Any disputed portion of the claim, as identified by the CONTRACTOR in writing, shall be submitted to nonbinding mediation, with OWNER and CONTRACTOR sharing the associated costs equally. OWNER and CONTRACTOR 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 described in sections K through O (below).

F. For purposes of this Article, 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 sections D and E, (above).

G. Unless otherwise agreed to by OWNER and CONTRACTOR in writing, the mediation conducted pursuant to section E (above) shall excuse any further obligation under Public Contract Code section 20104.4 to mediate after litigation has been commenced.

H. Failure by OWNER 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 OWNER'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 CONTRACTOR.

I. CONTRACTOR may present to OWNER 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 OWNER 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 OWNER and, if the CONTRACTOR did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

J. Except for tort claims, all claims or any portion of the claim(s) by CONTRACTOR remaining in dispute of $375,000 or less shall be subject to the provisions of Public Contract Code Section 20104 et seq., except that the provisions of Public Contract Code section 20104.4 relating to mediation after litigation has commenced are excused, unless a written agreement to the contrary has been entered into between the parties.

Only claims, regardless of size, for which timely notice has been given, which have been subjected to the procedures specified in Public Contract Code section 9204, remaining “unresolved” may be pursued through litigation. All other CONTRACTOR claims are deemed waived.

K. The parties shall attempt to resolve all claims during the course of the Project using the procedures set forth in Articles 55 and 56. Pending resolution of a claim, CONTRACTOR shall diligently continue to work on the Project to completion. CONTRACTOR agrees it will neither rescind the Contract Documents nor stop the progress of the work, and CONTRACTOR'S sole remedy shall be the procedures set forth in Articles 55 and 56.

ARTICLE 57 PERFORMANCE/PAYMENT BOND

A. Unless otherwise specified in the Contract Documents, CONTRACTOR shall furnish a Performance Bond, and for any contract of $25,000 or more, a Payment Bond, each in an amount equal to 100 percent of the price stated in the Contract Documents. All bonds shall be provided by a corporate surety admitted in California. Personal sureties and unregistered sureties are unacceptable. The Performance Bond shall remain in full force and effect through the guarantee period as specified in the Contract Documents and through such extended period as permissible to cover latent conditions.

B. All surety companies with a minimum rating of "A minus, VIII,” (“A minus V” when the price stated in the Contract Documents is less than $500,000) as rated by the current edition of Best's Key Rating Guide, published by A.M. Best Company, Oldwick, New Jersey, 08858, and admitted in California shall be presumed to be satisfactory to OWNER for the issuance of bonds. In the alternative, any admitted surety company which satisfies the requirements set forth in California Code of Civil Procedure Section 995.660 shall be accepted and approved for the issuance of bonds.

ARTICLE 58 INSURANCE REQUIREMENTS

A. CONTRACTOR shall provide the following insurance coverages, which shall remain in full force and effect during the Project:

1. Workers' Compensation;

2. Comprehensive General Liability;

3. Comprehensive Auto Liability;

4. Asbestos Abatement (on all modernization projects and on any other projects where asbestos-containing products may be affected by construction);

5. Course of Construction/Builder's Risk.

B. All insurance companies must meet the following criteria:

1. California admitted, as confirmed by the California Department of Insurance, or listed in the California Department of Insurance's List of Eligible Surplus Line Insurers ("LESLI list")

2. A minimum rating of "A-,VIII," as rated by the current edition of Best's Key Rating Guide, published by A.M. Best Company, Oldwick, New Jersey, 08858.

C. All CONTRACTOR'S insurance policies shall name OWNER's governing board or other governing body, OWNER's consultants, the Architect, and the Architect's consultants, their officers, agents and employees as additional insureds with regard to damages and defense of claims arising from:

1. Activities performed by or on behalf of the Named Insured;

2. Products and completed operations of Named Insured;

3. Premises owned, leased or used by the Named Insured;

4. The ownership, operation, maintenance, use, loading, or unloading of any auto owned, leased, hired, or borrowed by the Named Insured.

D. Should CONTRACTOR fail to provide insurance as required by the Contract Documents, OWNER may, at OWNER's option, take out and maintain at the expense of CONTRACTOR, insurance in the name of CONTRACTOR, or subcontractor, as OWNER may deem proper. OWNER may deduct the cost of taking out and maintaining

such insurance from any sums which are due or to become due to CONTRACTOR under the Contract Documents.

E. Insurance coverage shall not be less than the following:

1. WORKERS' COMPENSATION

a. In accordance with the provisions of Section 3700 of the California Labor Code, CONTRACTOR and every subcontractor shall be required to secure the payment of compensation to its employees.

b. In accordance with the provisions of Section 3700 of the California Labor Code, CONTRACTOR and every subcontractor shall be required to secure the payment of compensation to its employees.

c. CONTRACTOR shall at all times maintain workers' compensation insurance for all of its employees engaged in work under the Contract Documents, on or at the site of the Project. In case any of its work is sublet, CONTRACTOR shall require the subcontractor to similarly provide workers' compensation insurance for all of the subcontractors' employees. Any class of employee or employees not covered by a subcontractor's insurance shall be covered by CONTRACTOR's insurance. In case any class of employees engaged in work under the Contract Documents, on or at the site of the Project, is not protected under the workers' compensation statutes, CONTRACTOR shall provide or shall cause a subcontractor to provide adequate insurance coverage for the protection of such employees not otherwise protected before subcontractor commences work. CONTRACTOR shall file with OWNER certificates of its insurance protecting workers and a 30-day notice shall be provided to OWNER before the cancellation or reduction of any policy of CONTRACTOR or subcontractor. CONTRACTOR shall submit proof of insurance and provide endorsements on the forms provided by OWNER or on forms approved by OWNER.

d. The certificate shall reflect coverage in at least the following amounts:

(1) State workers' compensation statutory benefits policy—limits of not less than $1,000,000.

(2) Employer's liability policy—limits of not less than $1,000,000.

2. COMMERCIAL GENERAL LIABILITY

a. CONTRACTOR shall take out and maintain such commercial general liability insurance as shall protect CONTRACTOR and OWNER from all claims for personal injury, including accidental death, to any person (including, as to OWNER, injury or death to CONTRACTOR's or subcontractor's employees), as well as from all claims for property damage arising from operations under the Contract Documents, in amounts set forth in this article.

b. CONTRACTOR shall require its subcontractors, if any, to take out and maintain similar general commercial liability insurance in like amounts.

c. Coverage must be written on an occurrence versus a "claims made" form with policy limits not less than $1,000,000 per occurrence and $2,000,000 aggregate per project on bodily injury and property damage, and include coverage for the following:

(1) Premises - operations;

(2) Contractual liability;

(3) Products;

(4) Completed operations;

(5) Broad form property damage including explosion, collapse, and underground coverages;

(6) Personal injury;

d. In the event of any payment under the Commercial General Liability Policy, the insurer shall be subrogated to the extent of such payment to all the insured's rights of recovery, but the insurer shall have no rights of subrogation against OWNER, OWNER's consultants, the Architect, and the Architect's consultants, their elected or appointed officials, or employees, except as respects the negligence of OWNER, the Architect, and Architect's consultants.

3. COMPREHENSIVE AUTO LIABILITY INSURANCE

Such insurance shall have combined single limits of not less than $1,000,000, bodily injury, property damage, including coverage for owned, non-owned and hired autos.

4. ASBESTOS ABATEMENT

a. Must be occurrence coverage versus “claims made” coverage.

b. $1,000,000 per occurrence with not less than $2,000,000 annual aggregates limits required.

c. Certificates of insurance must specify “asbestos abatement.”

5. COURSE OF CONSTRUCTION (COC)/BUILDER’S RISK INSURANCE

a. When required by OWNER, on new school construction project, CONTRACTOR may be required to provide builders risk coverage with limits equal to 100 percent of the insurable value of the Project, including all items of labor and materials in or adjacent to the structure insured, all materials in place or to be used as part of the permanent construction, including surplus materials, shanties, protective fences, bridges, or temporary structures, miscellaneous materials and supplies incident to the work, and such scaffolding, staging, towers, forms, and equipment as are not owned or rented by CONTRACTOR, the cost of which are included in the cost of the Work. Such insurance shall be maintained for the life of the Contract.

b. If required by OWNER, CONTRACTOR shall maintain a Builder's Risk Completed Value Form providing all risk coverage, naming CONTRACTOR and OWNER as insureds and subcontractors to all levels as additional insureds, as their respective interests appear.

c. A maximum deductible of $5,000 per occurrence will be allowed on projects. CONTRACTOR shall be responsible for any deductibles under the property insurance policy.

d. The builder's risk insurance limits shall initially be for the full amount of the Project price shown in the Agreement document and shall be maintained in full force and effect at all times between the signing of the contract and final acceptance of the completed work by OWNER at an amount equaling the estimated cost to OWNER of rebuilding.

F. CONTRACTOR shall be responsible for payment of any deductibles under any of the above named coverages.

ARTICLE 59 PROOF OF INSURANCE COVERAGE

A. CONTRACTOR shall deliver in triplicate proof of carriage of required insurance. This proof shall be presented with the required Payment and Performance Bonds and return of other Contract Documents.

B. CONTRACTOR shall not commence work or allow any subcontractor to commence work under this contract until CONTRACTOR has obtained all required insurance and certificates, which shall be delivered to and approved by OWNER.

C. Certificates and insurance policies shall include the following:

1. A clause stating:

"This policy shall not be canceled or reduced in required limits of liability or amount of insurance until notice has been mailed to certificate holder stating the date of cancellation or reduction. The date of cancellation or reduction may not be less than 30 days after the date of mailing the notice."

2. Transcripts from the policies authenticated by the proper office of the insurer evidencing, in particular, those insured, the extent of the insurance, the location of and the operations to which the insurance applies, expiration date, and cancellation and reduction notice.

3. A statement that OWNER is a named additional insured under the policy described and that the insurance policy shall be primary to any insurance or self-insurance maintained by OWNER.

E. OWNER shall be named as certificate holder and additional insured and all certificates with endorsements shall be forwarded in triplicate to OWNER.

F. In the event of modification or cancellation of the policy or policies during the periods of coverage stated in this article, 30 days' prior written notice of such cancellation shall be delivered or mailed by certified mail, return receipt requested, to OWNER.

G. Acceptance of the certificates of insurance shall not relieve or decrease CONTRACTOR's liability. Insurance coverage in the minimum amounts set forth in the Contract Documents shall not be construed to relieve CONTRACTOR of liability in excess of such coverage, nor shall it preclude OWNER from taking such other actions as are available to it under any other provisions of the Contract Documents or otherwise in law.

ARTICLE 60 INDEMNIFICATION

A. CONTRACTOR shall hold harmless, defend, and indemnify OWNER, the Architect, and Inspector of Record and the officials, officers, employees, volunteers, and agents, and each of them, from any and all claims, demands, causes of action, costs, expenses, liability, loss, damage or injury, in law or equity, to property or persons, including wrongful death, in any manner arising out of or incident to any acts, omissions, or willful misconduct of CONTRACTOR, its officials, officers, employees, agents, consultants, and subcontractors arising out of or in connection with the performance of the Work or the Contract Documents, including without limitation the payment of all consequential damages and attorneys fees and other related costs and expenses. At CONTRACTOR's own cost, expense, and risk and with counsel reasonably satisfactory to OWNER, CONTRACTOR shall defend any and all such suits, actions, or other legal proceedings of every kind that may be brought or instituted against OWNER, the Architect, Inspector of Record, and their directors, officials, officers, employees, agents, or volunteers. CONTRACTOR shall pay and satisfy any judgment, award, or decree that may be rendered against OWNER, the Architect, Inspector of Record or their directors, officials, officers, employees, agents, or volunteers, in any such suit, action, or other legal proceeding. CONTRACTOR shall reimburse OWNER, the Architect, Inspector of Record and their directors, officials, officers, employees, agents, and volunteers, for any and all legal expenses and costs incurred by each of them in connection with any suit, action, or legal proceeding, or in enforcing the indemnity provided under this Article.

B. CONTRACTOR shall require each subcontractor to hold harmless, defend, and indemnify OWNER, the Architect, Inspector of Record and their officials, officers, employees, volunteers and agents, from any and all claims, demands, causes of action, costs, expenses, liability, loss, damage, or injury, in law or equity, to property or persons, including wrongful death, in any manner arising out of or incident to any acts, omissions, or willful misconduct of subcontractor its officials, officers, employees, agents, consultants and subcontractors arising out of or in connection with the performance of the Work or the Contract Documents, including without limitation the payment of all consequential damages and attorneys' fees and other related costs and expenses. At subcontractor's own cost, expense and risk, subcontractor shall defend any and all such suits, actions, or other legal proceedings of every kind that may be brought or instituted against OWNER, the Architect, Inspector of Record, and their directors, officials officers, employees, agents or volunteers. Subcontractor shall pay and satisfy any judgment, award, or decree that may be rendered against OWNER, the Architect, Inspector of Record, or their directors, officials, officers, employees, agents or volunteers, in any such suit, action, or other legal proceeding. Subcontractor shall reimburse OWNER, the Architect, Inspector of Record, and their directors, officials, officers, employees, agents, and volunteers, for any and all legal expenses and costs incurred by each of them in connection with any suit, action, or legal proceeding, or in enforcing the indemnity provided under this article.

C. The obligations of this Article expressly include but are not limited to the obligations of indemnification and defense of OWNER, the Architect, Inspector of Record, and their directors, officials, officers, agents and employees arising in any manner out of any claims against them brought by other contractors, subcontractors, material suppliers, or other third parties alleging any of them owe the claimant either time, compensation, or damages due to any act, omission, or occurrence caused or contributed to in any degree by CONTRACTOR or any of its subcontractors.

ARTICLE 61 ASSIGNMENT

CONTRACTOR shall not assign any rights, delegate any duties, transfer, convey, sublet, or otherwise dispose of the Construction Agreement or of its rights, title, or interest in or to the Construction Agreement or any part of it. If CONTRACTOR assigns, transfers, conveys, sublets, or otherwise disposes of the Construction Agreement or its right, title, or interest in it, or any part of it, any attempted or purported assignment, transfer, conveyance, sublease, or other disposition, shall be null, void, and of no legal effect whatsoever, and at OWNER's option the Construction Agreement may be terminated, revoked, and annulled, and OWNER shall then be discharged from any and all liability and obligations to CONTRACTOR, and to its purported assignee or transferee, arising out of the Construction Agreement. This expressly includes but is not limited to any attempts to create "pass through" or similar rights for subcontractors to pursue claims directly against OWNER.

ARTICLE 62 SEPARATE CONTRACTS

A. OWNER reserves the right to let other contracts in connection with this Work. CONTRACTOR shall afford other contractors reasonable opportunity for introduction and storage of their materials and execution of their work, and shall coordinate its work with those other contractors.

B. If any part of CONTRACTOR's work depends upon work of any other contractor for proper execution of results, CONTRACTOR shall inspect and promptly report in writing to the Architect any defects in the other contractor's work that render it unsuitable for proper execution or results. CONTRACTOR's failure to inspect and report shall constitute its acceptance of any other contractor's work as fit and proper for reception of its work except as to defects which may develop in another contractor's work after execution of CONTRACTOR's work.

C. To ensure proper execution of CONTRACTOR's subsequent work, CONTRACTOR shall measure and inspect work already in place and shall report in writing to the Architect any discrepancy between executed work and the Contract Documents.

D. CONTRACTOR shall ascertain to CONTRACTOR's satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by OWNER in connection with the Project, in order that CONTRACTOR may perform the work in light of any other contracts. Nothing contained in the Contract Documents shall be interpreted as granting to CONTRACTOR exclusive occupancy of the Project site. CONTRACTOR shall not cause any unnecessary hindrance or delay to any other contractor working on the Project. If simultaneous execution of any contract for the Project is likely to cause interference with performance of some other contract or contracts, OWNER shall decide which contractor shall cease work temporarily and which contractor shall continue or whether work can be coordinated so that the contractors may proceed simultaneously. OWNER shall not be responsible for any damage suffered or extra costs incurred by CONTRACTOR resulting directly or indirectly from the award or performance or attempted performance of any other contract or contracts on the Project, or caused by any decision or omission of OWNER regarding the order in performing or coordinating the contracts.

ARTICLE 63 OWNER'S RIGHT TO TERMINATE CONTRACT

Termination for Cause:

A. OWNER may serve upon CONTRACTOR and its surety written notice of OWNER’s intention to terminate the Construction Agreement, without prejudice to any other right or remedy, upon the occurrence of any of the following circumstances:

1. If CONTRACTOR refuses or fails to pursue the Work or any part with sufficient diligence to ensure its completion within the time specified, or any extension of time;

2. If CONTRACTOR refuses or fails to complete the Work within the time required;

3. If CONTRACTOR is adjudged a bankrupt, or makes a general assignment for the benefit of its creditors;

4. If a receiver is appointed on account of CONTRACTOR’s insolvency;

5. If CONTRACTOR persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials to complete the Work in the time specified, except in cases for which extension of time is provided;

6. If CONTRACTOR fails to make prompt payment to subcontractors or for material or labor;

7. If CONTRACTOR persistently disregards laws, ordinances, or instructions of OWNER;

8. If CONTRACTOR or its SUBCONTRACTORS violates any of the provisions of the Contract Documents.

B. The notice of intent to terminate shall contain the reasons for termination.

C. Unless the identified condition(s) or violation(s) ceases and arrangements satisfactory to OWNER for correction are made within 10 days after service of the notice, the Construction Agreement may be terminated, in the total discretion of OWNER. In that event, CONTRACTOR shall not be entitled to receive any further payment until the Work is completed.

D. In the event of OWNER's election to terminate, OWNER shall immediately serve written notice of termination upon CONTRACTOR and upon surety on CONTRACTOR's Performance Bond, and the surety shall then have the right to take over and perform this contract; provided however that if within seven days after service upon the surety of the notice of election to terminate, the surety does not give OWNER written notice of its intention to take over and perform the Construction Agreement, or does not commence performance within 15 days after the date of service of the notice of termination by OWNER on surety, OWNER may take over and complete the Work by contract or by any other method it deems advisable.

E. CONTRACTOR and its surety shall be liable to OWNER for any excess cost or other damages incurred by OWNER. If OWNER takes over the Work as provided above, OWNER may exclude CONTRACTOR and the surety from the premises, or any portion of the premises, and take control of the premises without liability and without affecting the liability of CONTRACTOR and the surety for completion of the Work. In addition, OWNER may take possession of and utilize in completing the Work any materials, appliances, equipment, and other property belonging to CONTRACTOR on the work site necessary for completion of the Project, without liability.

F. If the unpaid balance of the contract price exceeds the expense of finishing the Work, including without limitation compensation for additional architectural, managerial, inspection, and administrative services, the excess shall be paid to CONTRACTOR. If the expense exceeds the unpaid balance, CONTRACTOR shall pay the difference to OWNER. Any expenses incurred by OWNER, and any damage incurred through CONTRACTOR's default, shall be certified by the Architect.

G. These provisions are in addition to and not a limitation on any other rights or remedies available to OWNER.

Termination for Convenience:

H. OWNER has discretion to terminate this Agreement at any time and require CONTRACTOR to cease all work on the project by providing CONTRACTOR written notice of termination specifying the desired date of termination. Upon receipt of written notice from OWNER of such termination for OWNER's convenience, CONTRACTOR shall:

1. Cease operations as directed by OWNER in the notice;

2. Take any actions necessary, or that OWNER may direct, for the protection and preservation of the Work; and

3. Maintain any insurance provisions required by the Contract Documents.

In case of termination for OWNER's convenience, CONTRACTOR shall be entitled to receive payment from OWNER for work satisfactorily executed and for proven loss with respect to materials, equipment, and tools, including overhead and profit for that portion of the work completed. In the case of termination for convenience, OWNER shall have the right to accept assignment of subcontractors. The foregoing provisions are in addition to and not in limitation of any other rights or remedies available to OWNER.

ARTICLE 64 NO WAIVER

The failure of OWNER in any one or more instances to insist upon strict performance of any of the terms of the Contract Documents, or to exercise any option conferred in them, shall not be construed as a waiver or relinquishment to any extent of the right to assert or rely upon any such terms or option on any future occasion.

ARTICLE 65 EXCISE TAXES

If any transaction under the Contract Documents constitutes a sale on which a federal excise tax is imposed under federal excise tax law, and the sale is exempt from the excise tax because it is a sale to a state or local government for its exclusive use, upon request OWNER will execute a certificate of exemption which will certify that (1) OWNER is a political subdivision of the State for the purpose of such exemption, and (2) the sale is for the exclusive use of OWNER. No excise tax for such materials shall be included in any bid price.

ARTICLE 66 NOTICE OF TAXABLE POSSESSORY INTEREST

The terms of the Contract Documents may result in the creation of a possessory interest. If a possessory interest is vested in a private party to the Contract Documents, the private party may be subjected to the payment of property taxes levied on such interest.

ARTICLE 67 ASSIGNMENT OF ANTITRUST ACTIONS

A. Public Contract Code Section 7103.5(b) provides:

> "In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the contractor or subcontractor offers and agrees to assign to the awarding body (OWNER) all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sect. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgment by the parties."

B. For itself and all subcontractors, CONTRACTOR agrees to assign to OWNER all rights, title, and interest in and to all such causes of action CONTRACTOR and all subcontractors may have under the Contract Documents. This assignment shall become effective at the time OWNER tenders final payment to CONTRACTOR, and CONTRACTOR shall require assignments from all SUBCONTRACTORS to comply with this requirement.

ARTICLE 68 PATENTS, ROYALTIES, AND INDEMNITIES

CONTRACTOR shall hold harmless OWNER and its governing board or other governing body, officers, agents, and employees from liability of any nature or kind, including cost and expense, for or on account of any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Work of the Contract Documents, including its use by OWNER, unless otherwise specifically provided in the Contract Documents and unless such liability arises from the sole negligence, active negligence, or willful misconduct of OWNER.

ARTICLE 69 STATE AUDIT

Pursuant to and in accordance with the provisions of Government Code Section 8546.7, CONTRACTOR and any subcontractor connected with the performance of the Contract

Documents involving the expenditure of public funds in excess of $10,000, including, but not limited to the cost of administration of the Contract Documents, shall be subject to examination and audit by the State of California, either at the request of OWNER or as part of any audit of OWNER, for a period of three years after final payment is made under the Contract Documents.

ARTICLE 70 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Every provision of law and clause required by law to be inserted in the Contract Documents shall be deemed to be inserted, and the Contract Documents shall be read and enforced as though it were included. If through mistake or otherwise any provision is not inserted or is not correctly inserted, upon application of either party the Contract Documents shall be amended to make the insertion or correction. All references to statutes and regulations shall include all amendments, replacements, and enactments on the subject which are in effect as of the date of the Contract Documents and any later changes which do not materially and substantially alter the positions of the parties.

ARTICLE 71 NOTICE AND SERVICE

A. Any notice from one party to the other under the Contract Documents shall be in writing and shall be dated and signed by the party giving the notice or by a duly authorized representative of the party. Any notice shall not be effective for any purpose unless served in one of the following ways:

B. If notice is given to OWNER, by personal delivery to OWNER or by depositing the notice in the United States mail, enclosed in a sealed envelope addressed to OWNER and sent by registered or certified mail with postage prepaid.

C. If notice is given to CONTRACTOR, by personal delivery to CONTRACTOR or to CONTRACTOR's superintendent at the Project Site, or by depositing the notice in the United States mail, enclosed in a sealed envelope addressed to CONTRACTOR at its regular place of business or at such address as may have been established for the conduct of work under the Contract Documents, and sent by registered or certified mail with postage prepaid.

D. If notice is given to surety or other persons, by personal delivery or by depositing the notice in the United States mail, enclosed in a sealed envelope addressed to the surety or person at the address last communicated by the surety or other person to the party giving notice, and sent by registered or certified mail with postage prepaid.

ARTICLE 72 DISABLED VETERAN BUSINESS ENTERPRISE COMPLIANCE

A. In accordance with Education Code Section 17076.11, OWNER has a participation goal for disabled veteran business enterprises of at least three percent per

year of the overall dollar amount of funds allocated to OWNER by the State Allocation Board pursuant to the Leroy F. Greene School Facilities Act of 1998 for construction or modernization and expended each year by the school district.

B. Prior to, and as a condition precedent for final payment under any contract for such project, CONTRACTOR shall provide appropriate documentation to OWNER identifying the amount paid to disabled veteran business enterprises in conjunction with the Contract Documents, so that OWNER can assess its success at meeting this goal.

11-SUPPLEMENTAL GENERAL CONDITIONS

SUPPLEMENTAL GENERAL CONDITION NO. 1

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

Delete in its entirety Paragraph B of Article 58 of the General Conditions, on criteria for insurance companies, and use the following provisions:

B. All insurance companies must meet the following criteria:

1. U.S. Treasury listed;

2. California admitted, as confirmed by the California Department of insurance, or listed in the Department of Insurance's List of Eligible Surplus Line Insurers ("LESLI List");

3. All insurance companies with a minimum rating of as rated by the current edition of Best's Key Rating Guide, published by A.M. Best Company, Oldwick, New Jersey, 08858, and admitted to do business in California shall be presumed to be satisfactory to OWNER for the issuance of insurance.

SUPPLEMENTAL GENERAL CONDITION NO. 2

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

Delete in its entirety Article 50 of the General Conditions, on Progress Schedule, and use the following provisions:

ARTICLE 50 SCHEDULING REQUIREMENTS

A. The construction schedule is an integral part of the Work. Failure by CONTRACTOR to comply with these provisions constitutes failure by CONTRACTOR to satisfactorily complete any and all portions of the Work performed during the time period(s) of noncompliance.

B. The Architect and OWNER will set the time and location for any preconstruction meeting. Attendance by CONTRACTOR's management personnel responsible for the management, administration, and execution of the project is mandatory for any meeting convened. CONTRACTOR's baseline construction schedule shall be submitted prior to any preconstruction meeting called on the Project. Failure by CONTRACTOR to have CONTRACTOR's responsible project personnel attend any preconstruction meeting will be grounds for default by CONTRACTOR pursuant to the Contract Documents. No separate payment will be made for CONTRACTOR's attendance at the meeting. The Notice to Proceed will only be issued on or after completion of any preconstruction meeting.

C. It is expressly understood and agreed that the time of beginning, the rate of progress, and the time of completion of the Work are of the essence of the Contract Documents. The Work shall be executed with such progress as required to prevent any delay to other contractors working at the site, the Project milestones, and Project completion as required by the Contract Documents. Should CONTRACTOR fail to comply with these provisions, progress payments may be stopped until OWNER determines to its satisfaction that CONTRACTOR is in compliance with these provisions.

D. CONTRACTOR is required to employ or retain the services of a Construction Scheduler. The Construction Scheduler shall have not less than three years of verifiable experience as the person primarily responsible for preparing and maintaining detailed project schedules on projects of the same or similar size and nature as this project. The Construction Scheduler is required to attend all meetings relating to scheduling and progress of the Work. If the Construction Scheduler leaves the

employment of CONTRACTOR, CONTRACTOR will be required to fulfill the requirements of this paragraph within 15 days. As used in these provisions, “days” means consecutive calendar days unless noted otherwise.

E. Within 10 days after the Notice to Proceed, CONTRACTOR shall provide the following for OWNER'S review and acceptance:

1. Identification, qualifications, and experience of CONTRACTOR’s Construction Scheduler and all other members of CONTRACTOR's scheduling staff.

2. References of not less than two other previous projects on which CONTRACTOR's Construction Scheduler has utilized Critical Path Method (“CPM”) scheduling.

3. A description of the scheduling system to be utilized.

F. CONTRACTOR shall use commercially available software of the most recent version of *Sure Trak Project Manager* by Primavera Systems, Inc., *Primavera Project Planner* by Primavera Systems, Inc., or equal, and shall submit to OWNER a 3.5 inch data disk with all network information contained on it, in a format readable by a DOS system utilizing Windows software. OWNER will use a *Sure Trak, Primavera,* or equal software program for review of CONTRACTOR's schedule.

G. CONTRACTOR shall submit the baseline construction schedule pursuant to the submittal requirements of the Contract Documents prior to the preconstruction meeting. The preconstruction meeting will not be convened until CONTRACTOR's baseline construction schedule has been determined to meet the requirements of the Contract Documents.

H. CONTRACTOR shall prepare the baseline construction schedule as a CPM schedule in the Precedence Diagram Method (activity-on-node) format. The baseline construction schedule shall depict a workable plan showing the sequence, duration, and interdependence of all activities required to represent the complete performance of all work on this Project. The baseline construction schedule shall begin with the projected date of issuance of the Notice to Proceed and conclude with the date of final completion per the project duration specified in the Contract Documents. The baseline construction schedule shall include detail of all project phasing, staging, and sequencing, including all milestones necessary to define beginning and ending of each phase or stage. The submittal requirements include:

1. A complete time-scaled network diagram showing all of the activities, logic relationships, and milestones comprising the schedule.

2. A tabular listing of all the activities, showing for each activity the identification number, description, duration, early start, early finish, late start, late finish, total float, and all predecessor and successor activities for the activity described.

3. An allowance per month reflecting anticipated “normal” inclement weather.

4. A 3.5 inch floppy disk containing the schedule data of the baseline schedule.

I. Within 20 days after issuance to CONTRACTOR of the Notice to Proceed, CONTRACTOR shall submit to OWNER a detailed schedule for the first 90 days of work after the Notice to Proceed, as well as a general approach for the remainder of the work. When revised, the preliminary project schedule will represent CONTRACTOR's planned means, methods, and sequences for performance of the work during the first 90 days after the Notice to Proceed and is to be incorporated as the first 90 days of CONTRACTOR's detailed project schedule.

J. As part of the submittal of the preliminary project schedule, CONTRACTOR shall include for review and acceptance a schedule of costs assigned to each activity of the preliminary project schedule. The total of the assigned costs shall equal the project value specified in the Construction Agreement document.

K. When accepted by both OWNER and the Project Inspector, the preliminary project schedule shall form part of the basis by which the progress of work is measured. Submittal and approval of the preliminary project schedule is a condition precedent to the issuance and payment of progress payments. No progress payments will be made until the preliminary project schedule has been accepted by both OWNER and the Project Inspector.

L. The preliminary project schedule shall be updated monthly during the first 90 days after the Notice to Proceed or until the detailed project schedule is accepted as a part of the payment application process. All appropriate reports and the network diagrams required by these provisions shall be submitted.

M. CONTRACTOR shall prepare and submit to OWNER the detailed project schedule within 45 days after issuance to CONTRACTOR of the Notice to Proceed. The CONTRACTOR shall prepare the detailed project schedule as a CPM schedule in the Precedence Diagram Method (activity-on-node) format.

N. Form and Format of Initial Submittal, Revisions, and Updates:

1. The detailed project schedule shall include a time scaled network diagram for the full network of activities. Network diagrams shall be based on early start

and early finish dates of activities shown. The network diagram shall be prepared on (E) size sheets (30 inches by 42 inches), shall have a title block in the lower right-hand comer, and a time line on each page.

2. The detailed project schedule shall include activity data reports. Each report shall include the activity number, original duration, remaining duration, calendar identification, activity percent complete, identification codes, description, early or actual finish, late start, late finish, and total float. Required reports include:

a. Activity sort by activity number from lowest to highest;

b. Activity sort by the amount of total float, then in order of activity number;

c. Activity sort by early start for the next 90 days, then in order of activity number;

d. Predecessor/successor report including all predecessors, successors, and activity logical interrelationships;

e. Activity sort by activity number, listing the activity number, description, budget cost, earned cost, with a total of the budget costs to equal the value specified in the Construction Agreement document, and the total of the earned costs to equal the agreed amount earned through the end of the update period.

3. CONTRACTOR shall also prepare and submit a time-scaled summary bar chart schedule on a single sheet that shows the total project summarized by building or area in approximately 25 activities, as agreed to by CONTRACTOR and OWNER. The summary will accurately summarize the current detailed project schedule. All contract milestones shall be shown.

4. CONTRACTOR shall submit a data disk with all of the schedule data, calculations, report formats, and graphic formats used to create the schedule submission.

O. The detailed project schedule shall show the sequence and interdependence of activities required for complete performance of the Work, beginning with the date of the Notice to Proceed and concluding with the date of final completion of the project. Use of float suppression techniques, such as preferential sequencing, special lead/lag logic restraints, extended activity times, or imposed dates shall be cause for rejection of the detailed project schedule and any revisions or updates. Any approved schedule, revision, or update having an early completion date shall show as project float the time

between the early completion date and the then-current completion date as reflected in the Contract Documents.

P. The detailed project schedule shall provide OWNER with a tool to monitor and follow the progress of all phases of the Work. The detailed project schedule submitted to OWNER shall comply with all limits imposed by the scope of work, with all contractually specified intermediate milestone and completion dates, and with all constraints or sequences included in the Contract Documents. The degree of detail shall include, but not be limited to:

1. Physical and structural breakdown of the project;

2. Contract milestones, completion dates, constraints, restraints, sequences of work;

3. Type and sequence of work to be performed;

4. Purchase, submittal, submittal review, manufacturer, test, delivery, and installation activities for all major material and equipment;

5. Deliveries of OWNER-furnished equipment and/or materials in accordance with the dates or schedule windows of such items set forth in the Contract Documents or furnished by OWNER;

6. Preparation, submittal, and approval of shop and/or working drawings and material samples showing a 30-day minimum time specified for OWNER's review of normal or routine submittals;

7. Approvals required by regulatory agencies or other third parties;

8. Plans for all subcontract work;

9. Assignment of responsibility for performing specific activities;

10. Access and availability of work areas including all anticipated plant shutdowns;

11. Identification of interfaces and dependencies with preceding, concurrent, and follow-up contractors and utilities;

12. Any major testing, submission of test reports, and approval of test results;

13. Start up, testing, training, and assistance required under the Contract Documents;

14. Punch list and final cleanup; and

15. “Normal” inclement weather delay days: CONTRACTOR shall include an allowance for delays due to “normal” inclement weather per month within the detailed project schedule. The allowance may be indicated in the calendar section of the scheduling software or as a single critical path activity at the end of the project. The method of inclusion shall be clearly communicated in writing to OWNER; and

16. Identification of any manpower, material, or equipment restrictions, as well as any activity requiring unusual shift work, such as two shift, six-day weeks, specified overtime, or work at times other than regular days or hours.

Q. With the exception of submittal activities, activity duration shall not be shorter than one working day nor longer than 15 working days unless specifically and individually allowed by OWNER. The detailed project schedule shall include submittal, submissions of construction mockups, interfaces, milestones, OWNER-mandated milestones and reviews, equipment, procurement, and material fabrication and deliveries. The number of activities will be sufficient, in OWNER’s judgment, to communicate CONTRACTOR's plan for execution of the project, to accurately describe the project work, and to allow monitoring and evaluation of progress and time impacts. Each activity's description shall accurately define the work planned for the activity and each activity shall have recognizable beginning and end points. The logical relationship among activities shall be clearly indicated.

R. Float or slack time within the schedule is available without charge or compensation to whatever party or contingency first exhausts it. Float or slack time is not for the exclusive use or benefit of OWNER or CONTRACTOR but is an expiring resource available to all parties as needed to meet contract milestones and the project completion date.

S. Any submittals, utility interfaces, or any furnishing of OWNER-supplied materials, equipment, or services, which may impact any activity's construction, shall be shown as a restraint to those activities.

T. A detailed project schedule showing a project duration longer than the duration specified in the Construction Agreement is not acceptable and shall be a default by CONTRACTOR, unless expressly waived by OWNER in writing.

U. The detailed project schedule will show CONTRACTOR's plan to support and maintain the project for the entire contractual duration of the project. Should CONTRACTOR propose a shorter project duration than that specified in the Construction Agreement, a complete detailed project schedule must be submitted

reflecting the shorter duration, in complete accordance with all schedule requirements of the Contract Documents. At no cost to OWNER, OWNER may choose to accept CONTRACTOR's proposal of a project duration shorter than the duration specified, provided OWNER is satisfied the shortened detailed project schedule is reasonable and OWNER and all other entities which interface with the Project are able to support the provisions of the shortened detailed project schedule. OWNER's acceptance of a shortened project duration will be confirmed through execution of a contract change order revising the project duration and implementing all contractual requirements, including liquidated damages, in accordance with the revised duration. In the absence of an accepted shortened project duration, CONTRACTOR shall continue to maintain the completed facilities until the scheduled completion date. Acceptance of a proposed schedule reflecting an early completion date rests entirely in the discretion of OWNER.

V. The allocated cost to perform each work activity shall be noted for each activity in the detailed project schedule. The sum of the costs assigned to all activities shall equal the contract value specified in the Construction Agreement. No activity costs shall be assigned to submittals or submittal reviews. The accepted cost-loaded detailed project schedule shall constitute the schedule of values from which CONTRACTOR will formulate monthly progress payment requests.

W. OWNER will review and make comments on the detailed project schedule. Meetings will be held between OWNER, CONTRACTOR, and all major subcontractors and/or suppliers to resolve any conflicts between the detailed project schedule and the intent of the Contract Documents. The term "major subcontractors and/or suppliers" as used in these provisions shall include any subcontractor or supplier with 10 percent or more of the value of the Project. Any other subcontractor or supplier representatives whom CONTRACTOR may desire to invite, or whom OWNER may request, shall attend. Comments made by OWNER during review of the detailed project schedule will not relieve CONTRACTOR from compliance with requirements of the Contract Documents. To the extent that there are any conflicts between the approved schedule and the requirements of the Contract Documents, the Contract Documents shall govern.

X. Detailed Project Schedule Acceptance:

1. OWNER will review and return to CONTRACTOR, along with any comments, CONTRACTOR's proposed detailed project schedule with one of the following designations:

a. "Accepted"—CONTRACTOR may proceed with the project work and will receive payment for the schedule in accordance with these provisions.

b. "Accepted with Comments"—CONTRACTOR may proceed with the project work. CONTRACTOR must resubmit the schedule incorporating

the comments prior to receipt of payment pursuant to these provisions. CONTRACTOR shall have a maximum of 10 working days to make the required changes and resubmit to OWNER.

c. "Not Accepted"—CONTRACTOR may elect to proceed with the project work at its own risk. CONTRACTOR will not receive any payment for any project work until the schedule is resubmitted and designated "Accepted" or "Accepted with Comments" by OWNER. CONTRACTOR shall have a maximum of 10 working days to make the required changes and resubmit to OWNER. Should CONTRACTOR elect not to proceed with the Project, or to delay any portion of the Project, any resulting delay, impact, or disruption to the Project shall be CONTRACTOR's responsibility.

2. CONTRACTOR shall revise the detailed project schedule in accordance with the review comments. Resubmittals shall be as required by these provisions on schedule submittals. Review and response by OWNER shall be given within seven days after receipt of each new submission.

Y. Should the detailed project schedule show variances from the requirements of the Contract Documents, CONTRACTOR shall make specific mention of those variations in the letter of transmittal. In the absence of specific mention of variances, CONTRACTOR will not be relieved of the responsibility for executing the Work in strict accordance with the requirements of the Contract Documents.

Z. Once accepted, the detailed project schedule becomes the record schedule which shall be used for monitoring and evaluating all facets of project performance, including but not limited to progress, changes, disruption, acceleration, and delays.

AA. The record schedule shall be reviewed by CONTRACTOR'S Project Manager and Construction Scheduler at a joint update meeting with OWNER for the purpose of verifying and agreeing upon:

1. Actual start dates for individual activities;

2. Actual completion dates for individual activities (when an activity is deemed complete, then such activity will no longer be treated as an activity affecting the critical path or successor activities on the project);

3. Cost value of accepted work reported in place;

4. Activity percent completion;

5. Incorporation of approved changes and approved time extensions;

6. Status of outstanding notices of noncompliance;

7. Remaining duration for incomplete activities;

8. Schedule adjustments for authorized change orders, revised or added activities, duration, and network logic where required;

9. The schedule data disk of the updated schedule; and

10. A tabular listing of all of the activities, showing for each activity the identification number, description, duration, early start, early finish, late start, late finish, or actual dates, total float, and all the predecessor and successor activities for the activity described.

BB. CONTRACTOR shall submit monthly update schedules to OWNER each month on a date assigned by OWNER. The proposed updated schedule prepared by CONTRACTOR shall include all information available as of the cutoff date established by OWNER. A detailed list of all proposed schedule changes (logic, duration, status, additions, and deletions) shall be submitted with the update.

CC. The monthly updated schedules shall be accompanied by a schedule narrative report. The schedule narrative report shall describe the physical progress during the report period, plans for continuing the work during the report period, actions planned to correct any negative float predictions, and an explanation of potential delays and/or problems and their estimated impact on performance and the overall project completion date. In addition, alternatives for possible schedule recovery to mitigate any potential delay shall be included for consideration by OWNER. The bound report shall follow the outline below:

1. CONTRACTOR's transmittal letter.

2. Description of problem areas.

3. Current and anticipated delays.

   a. Cause of delay.

   b. Corrective action and schedule adjustments to correct the delay.

   c. Impact of delay on other activities, milestones, and completion dates.

4. Changes in construction sequences.

5. Pending items and status, including:

a. Permits.

b. Change orders.

c. Time Extensions.

d. Noncompliance notices.

6. Contract completion date(s) status.

a. Ahead of schedule and number of working days.

b. Behind schedule and number of working days.

7. Other project or scheduling concerns, including any plant shutdowns, duration of each shutdown, and analysis of any work to be performed during the shutdown period.

8. Agreed upon detail network diagram and reports.

9. Revised cost loading and cash flow Information.

DD. All network changes and status dates agreed to during a monthly update meeting shall be deemed accepted by all parties unless written objection is given by an objecting party within five days after the update meeting. For major network changes that cannot be agreed upon during an update meeting, CONTRACTOR shall submit such revisions in writing for OWNER's approval prior to inserting such changes into the network. Submissions may be in the form of marked-up networks, fragments, or schedule abstracts, provided they are submitted with a letter of transmittal.

EE. Predicated on the results of OWNER's review of the monthly update schedule and accompanying reports, CONTRACTOR may be required to revise the monthly update schedule. Conditions under which a revision will be made are as follows:

1. When a delay in the completion of any work item or sequence of work items indicates the need for an extension of the project completion or interim milestone dates by 10 working days or more.

2. When delays in submittals or deliveries or work stoppages are encountered which make replanning, rescheduling, or resequencing of the work necessary.

3. When the schedule does not represent the actual prosecution and progress of the project.

FF. Required revisions of the monthly update schedules are due within five days of notice by OWNER that a revision is required. All revisions and additions to the record schedule are subject to the review of OWNER. When the monthly schedule update or its required revision is accepted by OWNER, it then becomes the current record schedule. The current record Schedule will be used for the period from which it is accepted until its successor is submitted and accepted.

GG. OWNER will review and return to CONTRACTOR the monthly update schedule, with any comments, within 15 days of submittal. The monthly update schedule will be returned with one of the following designations:

1. '"Accepted "—CONTRACTOR may proceed with the project work, and will receive payment for the schedule in accordance with these provisions.

2. "Accepted with Comments"—CONTRACTOR may proceed with the project work. CONTRACTOR must resubmit the schedule incorporating the comments prior to receipt of payment pursuant to these provisions. CONTRACTOR shall have a maximum of five working days to make the required changes and resubmit to OWNER.

3. "Not Accepted"—CONTRACTOR may elect to proceed with the project work at its own risk. CONTRACTOR will not receive any payment for any project work until the schedule is resubmitted and designated "Accepted" or "Accepted with Comments" by OWNER. CONTRACTOR shall have a maximum of five working days to make the required changes and resubmit to OWNER. Should CONTRACTOR elect not to proceed with the Project, or to delay any portion of the Project, any resulting delay, impact, or disruption to the Project will be CONTRACTOR's responsibility.

HH. As a condition precedent to any release of retention, the last update to the record schedule submitted shall be identified by CONTRACTOR as the "As-Built Schedule" and shall reflect the exact manner in which the Project was actually constructed, showing accurate and actual start and finish dates for each schedule activity.

II Forty percent of the scheduling lump sum item will be released to CONTRACTOR if requested by CONTRACTOR in the pay application following OWNER's acceptance of the detailed project schedule.

JJ. The balance of the schedule lump sum item will be released in equal monthly increments over the life of the Project if requested by CONTRACTOR following

OWNER's acceptance of each monthly update. Should one or more month's updates not be accepted, payment for those months will be released upon the first following monthly update which is accepted by OWNER.

KK. Once each week, on a date established by OWNER, CONTRACTOR shall submit a progress schedule listing the activities completed and in progress for the previous week and the activities scheduled for the succeeding two weeks. The activity designations shall be consistent with the activity designations in the current record schedule. A bar chart shall be used to display the information in pictorial form.

LL. Whenever it becomes apparent from the current monthly update progress review meeting or the current record schedule that phasing, milestone, constraint, or project completion dates will not be met, CONTRACTOR shall execute some or all of the following remedial actions:

1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.

2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of these to eliminate the backlog of work.

3. Reschedule the work in conformance with the specification requirements.

4. For excusable delays, request a time extension in accordance with the requirements of these provisions.

MM. Prior to or concurrent with implementation of any of the above actions, and in compliance with the Contract Documents, CONTRACTOR shall notify OWNER in writing of the causes or reasons for any delay necessitating remedial action. Any resulting record schedule revisions shall be incorporated by CONTRACTOR into the monthly update schedule before the next update and described in the monthly narrative.

NN. Under no circumstances will the addition of equipment or construction forces, increasing the working hours or any other method, manner, or procedure to return to the contractually required completion date be considered justification for a change order or be treated as acceleration where the need for a remedial action has been caused by CONTRACTOR and/or its subcontractors or suppliers, at any tier. CONTRACTOR will be responsible for all costs to OWNER and otherwise to return to the contractually required completion date.

OO. OWNER may elect to withhold progress payments until CONTRACTOR's progress indicates the milestone date(s) and/or project completion date will be met.

PP. CONTRACTOR shall submit to OWNER a written time impact analysis illustrating the influence of each delay on the project completion date in the current record schedule. Each time impact analysis shall include a fragment demonstrating how CONTRACTOR proposes to incorporate the delay into the current monthly update schedule. A fragment is defined as a sequence of new and/or activity revisions that are proposed to be added to the current record schedule or the monthly update schedule in effect at the time the delay and the method for incorporating the delay and any impact into the schedule.

QQ. Each time impact analysis shall demonstrate the estimated time impact based on the events of the delay, the date delay was experienced by CONTRACTOR, the status of construction at that point in time, and the event time computation of all activities affected by the delay. The duration used in analysis shall be that included in the latest update of the record schedule in effect at the time the delay was encountered.

RR. Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities extend the project completion date.

SS. Each time impact analysis shall be submitted within 15 days after a delay occurs. If CONTRACTOR does not submit a time impact analysis for a specific delay within the specified period of time, CONTRACTOR shall be deemed to have irrevocably waived any rights to additional time and cost for that delay.

TT. Since float time within the record schedule and updates is jointly owned, it is acknowledged and agreed that any OWNER-caused delays to the Project may be offset by OWNER-caused time savings, including but not limited to critical path submittals returned in less time than allowed in the Contract Documents, approval of substitution requests which result in a savings of time along the critical path for CONTRACTOR, etc. In the event of OWNER-caused delays, CONTRACTOR shall not be entitled to receive an extension of time or damages of any kind, until all OWNER-caused time savings are exceeded and the project completion date is also exceeded.

UU. Acceptance or rejection of each time impact analysis by OWNER shall be made within 15 days after receipt of each time impact analysis, unless subsequent meetings and negotiations are necessary. Upon acceptance, a copy of a time impact analysis signed by OWNER shall be returned to CONTRACTOR for incorporation into the schedule.

VV. Upon mutual agreement by both parties, fragments illustrating the influence of delays shall be incorporated into the record schedule during the first update after agreement is reached.

WW. In the event CONTRACTOR does not agree with the decision of OWNER regarding the impact of a delay, the dispute shall be resolved in accordance with the dispute resolution provisions of the Contract Documents.

XX. If the detailed project schedule is not submitted, or modifications made and resubmitted, or updates submitted in accordance with the time schedule set forth in these provisions, it is agreed and understood that OWNER and the Project will suffer damage. The parties understand and agree that the goodwill of OWNER and other contractors or subcontractors, the progress of the Work, the Project monitoring and other business of OWNER and overall well-being of the Project will be damaged if CONTRACTOR's scheduling duties described above are not completed within the time limits required. The parties further agree that the exact amount of damages for failure to complete the scheduling duties within the time specified is, in some cases, extremely difficult, impractical, or impossible to determine and that regarding such damages, and in accordance with Government Code Section 53069.85, it is agreed that CONTRACTOR shall pay to OWNER as fixed and liquidated damages and not as a penalty the sum of $ for each calendar day of delay until such scheduling duties are completed and accepted. This amount shall be deducted from any payments due to or to become due to CONTRACTOR. CONTRACTOR and CONTRACTOR's surety shall be liable for the liquidated damages.

YY. In addition to any liquidated damages which may be assessed, if CONTRACTOR fails to complete the scheduling duties within the time periods specified in these provisions and if as a result OWNER finds it necessary to incur, or does incur, any costs and expenses (for example, relating to additional personnel being assigned to the Project, additional consultants, additional services of the architect or his consultants, or claims by anyone affected by CONTRACTOR's delay), CONTRACTOR shall pay all those costs and expenses incurred by OWNER. These costs and expenses may be retained by OWNER from any payments otherwise due to CONTRACTOR.

ZZ. In addition to withholding liquidated and other damages, if CONTRACTOR continues to fail to meet its scheduling duties for a period of 30 days or more, progress payments may be withheld until such time as CONTRACTOR has complied with its duties and the submissions are reviewed and approved by OWNER.

SUPPLEMENTAL GENERAL CONDITION NO. 3

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

Delete in its entirety Article on Disabled Veteran Business Enterprise Compliance and use the following provisions:

Each bidder must meet goals and requirements relating to participation by Disabled Veteran Business Enterprises established by OWNER, or make a good faith effort to do so, in accordance with the criteria established pursuant to Public Contract Code Section 2000(b). Documents related to compliance are included in the bid package and must be completed and returned with the bid or the bid may be deemed non-responsive.

SUPPLEMENTAL GENERAL CONDITION NO. 4

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

Add Article on Progress Meetings, as follows:

ARTICLE PROGRESS MEETINGS

CONTRACTOR shall attend all progress meetings and take clear and complete notes of the meetings and all subjects discussed at the meetings, submitting the notes within 48 hours of the end of the meeting to the Architect for review and comment. Notes shall be kept in a manner which will permit easy tracking of the progress of each topic of discussion.

SUPPLEMENTAL GENERAL CONDITION NO. 5

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

ARTICLE 46 PAYMENT

Delete in its entirety Paragraph A of Article 46 of the General Conditions and use the following provision:

A. This project has been designated as substantially complex. As such, Owner will retain 10% of any progress payment due to ensure satisfactory completion of the project. Each month within 30 days after receipt by OWNER of the monthly progress schedule and the certification of application for payment by the Architect, OWNER shall pay to CONTRACTOR a sum equal to 90 percent of the value of work performed and materials delivered subject to or under the control of OWNER and unused up to the last day of the previous month, less aggregate previous payments. In its sole discretion, OWNER may also deduct from these payments any amounts deemed due from CONTRACTOR.

12-PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the , (referred to as “Owner"), has awarded to (referred to as the "Contractor/ Principal") a contract for the work described as follows: .

WHEREAS, Contractor/Principal is required by Division 4, Part 6, Title 3, Chapter 5 (commencing at Section 9550) of the California Civil Code to furnish a bond in connection with the contract;

NOW, THEREFORE, we, the Contractor/Principal and as Surety, are held firmly bound unto Owner in the penal sum of Dollars ($), lawful money of the United States of America for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the Contractor/Principal, his/her or its heirs, executors, administrators, successors, or assigns, or a subcontractor, shall fail to pay any person or persons named in Civil Code Section 9100 or fail to pay for any materials or other supplies used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Code with respect to work or labor thereon of any kind, or shall fail to deduct, withhold, and pay over to the Employment Development Department any amounts required to be deducted, withheld, and paid over by Section 13020 of the Unemployment Insurance Code with respect to work and labor thereon of any kind, then said Surety will pay for the same, in or to an amount not exceeding the amount set forth above, and in case suit is brought upon this bond Surety will also pay such reasonable attorney's fees as shall be fixed by the court, awarded and taxed as provided in Division 4, Part 6, Title 3, Chapter 5 (commencing at Section 9550) of the California Civil Code.

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

It is further stipulated and agreed that the Surety of this bond shall not be exonerated or released from the obligation of the bond by any change, extension of time for performance, addition, alteration, or modification in, to, or of any contract, plans, specifications, or agreement pertaining or relating to any scheme or work of improvement described above or pertaining or relating to the furnishing of labor, materials, or equipment therefor, nor by any change or modification of any terms of payment or extension of the time for any payment pertaining or relating to any scheme or work of improvement described above, nor by any rescission or attempted rescission of the contract, agreement, or bond, nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond, nor by any fraud practiced by any person other than the claimant seeking to recover on the bond, and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given, and under no circumstances shall Surety be

released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the Owner and original contractor or on the part of any obligee named in such bond, but the sole conditions of recovery shall be that claimant is a person described in Section 8400 and 8402 of the California Civil Code and has not been paid the full amount of his/her or its claim and that Surety does hereby waive notice of any such change, extension of time, addition, alteration, or modification.

Any claims under this bond may be addressed to:

Name & address of Surety

Name & address of agent or representative in California, if different than above

Telephone # of Surety, or agent or representative in California

IN WITNESS WHEREOF, we have hereto set our hands and seals on this day of , 20 .

[SEAL]

Contractor/Principal

By: _____
Signature

Print Name Above

Print Title Above

Surety:

By: _____
Signature

Print Name Above

Print Title Above

[SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY]

13-PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS:

WHEREAS, the (referred to as "Owner"), has awarded to (referred to as "Contractor/Principal") a contract for the work described as follows: .

NOW, THEREFORE, we, the Contractor/Principal and , as Surety, are held firmly bound unto Owner in the penal sum of $ Dollars ($), lawful money of the United States of America for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION IS SUCH THAT, if the hereby bonded Contractor/Principal, its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by and well and truly keep and perform all the undertakings, terms, covenants, conditions, and agreements in the said contract and any alteration thereof, made as therein provided, including but not limited to the provisions regarding contract duration, indemnification, and liquidated damages, all within the time and in the manner therein designated in all respects according to their true intent and meaning, then this obligation shall become null and void; otherwise, it shall be and remain in full force and effect.

As a condition precedent to the satisfactory completion of the contract, the above obligation shall hold good for a period of year(s) after the acceptance of the work by the Owner, during which time if Contractor/Principal shall fail to make full, complete, and satisfactory repair and replacements and totally protect the Owner from loss or damage made evident during the period of year(s) from the date of completion of the work, and resulting from or caused by defective materials or faulty workmanship, the above obligation in penal sum thereof shall remain in full force and effect. The obligation of Surety under this bond shall continue so long as any obligation of Contractor/Principal remains.

Whenever Contractor/Principal shall be, and is declared by the Owner to be, in default under the contract, the Owner having performed the Owner's obligations under the contract, the Surety shall promptly remedy the default, or shall promptly:

1. Complete the contract in accordance with its terms and conditions; or

2. Obtain a bid or bids for completing the contract in accordance with its terms and conditions, an upon determination by Surety of the lowest responsive and responsible bidder, arrange for a contract between such bidder and the Owner, and make available as work progresses sufficient funds to pay the cost of completion less the balance of the contract price, but not exceeding, including other costs and damages for which Surety may be liable under this Performance Bond, the amount set forth above. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor/Principal by the Owner under the contract and any modifications to it, less the amount previously paid by the Owner to the Contractor/Principal.

Surety expressly agrees that the Owner may reject any contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Contractor/Principal.

Surety shall not utilize Contractor/Principal in completing the contract nor shall Surety accept a bid from Contractor/Principal for completion of the work if the Owner, when declaring the Contractor/Principal in default, notifies Surety of the Owner's objection to Contractor/Principal's further participation in the completion of the work.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the successors or assigns of the Owner. Any suit under this bond must be instituted within the applicable statute of limitations period.

FURTHER, for value received, the Surety hereby stipulates and agrees that no change, extension of time, alternation, or modification of the Contract Documents, or of the work to be performed under them, shall in any way affect its obligations on this bond; and it does hereby waive notice of any change, extension of time, alteration, or modification of the Contract Documents or of work to be performed under them.

Contractor/Principal and Surety agree that if the Owner is required to engage the services of an attorney in connection with the enforcement of this bond, each shall pay Owner's reasonable attorney's fees incurred, with or without suit, in addition to the above amount.

Any claims under this bond may be addressed to:

Name and address of Surety:

Name and address of agent or representative in California, if different than above:

Telephone number of Surety, or agent or representative in California:

IN WITNESS WHEREOF, we have hereto set our hands and seals on this day of , 20 .

[*SEAL*] CONTRACTOR/PRINCIPAL

By_____
Signature

Type or Print Name Above

Type of Print Title Above

SURETY

By_____
Signature

Type or Print Name Above

Type of Print Title Above

[*SEAL AND NOTARIAL ACKNOWLEDGMENT OF SURETY*]

14-WORKERS' COMPENSATION CERTIFICATE

PROJECT TITLE: BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

Labor Code Section 3700 provides:

> "Every employer except the state shall secure the payment of compensation in one or more of the following ways:
>
> "(a) By being insured against liability to pay compensation in one or more insurers duly authorized to write compensation insurance in this state.
>
> "(b) By securing from the Director of Industrial Relations a certificate of consent to self-insure either as an individual employer, or as one employer in a group of employers, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his or her employees.
>
> "(c) For any county, city, city and county, municipal corporation, public district, public agency, or any political subdivision of the state, including each member of a pooling arrangement under a joint exercise of powers agreement (but not the state itself), by securing from the Director of Industrial Relations a certificate of consent to self-insure against workers' compensation claims, which certificate may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to administer workers' compensation claims properly, and to pay workers' compensation claims that may become due to its employees. On or before March 31, 1979, a political subdivision of the state which on December 31, 1978, was uninsured for its liability to pay compensation, shall file a properly completed and executed application for a certificate of consent to self-insure against workers' compensation claims. The certificate shall be issued and be subject to the provisions of Section 3702."

I am aware of the provisions of Labor Code Section 3700 which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing and during the performance of the work on this Project.

Print Name of Contractor Above

By:_____ Date:

Print Name Above
Title:

[In accordance with Article 5 (commencing at Section 1860), Chapter 1, Part 7, Division 2 of the Labor Code, the above certificate must be signed and filed with the awarding body prior to performing any work under the contract.]

15-GUARANTEE

PROJECT TITLE: BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

We guarantee that the construction work described above has been performed in accordance with, and complies with, the Contract Documents. We agree to repair or replace any or all of the work, together with any other adjacent work which may be required in connection with it, that may prove to be defective in workmanship or material within a period of one year from the date of acceptance of the project by Owner and the filing of the final verified report with the Division of State Architect (DSA), ordinary wear and tear excepted.

In the event of our failure to comply with these conditions within the applicable time frame as determined by Owner pursuant to the Contact Documents, in no event later than one week after being notified in writing by Owner, we authorize Owner to proceed to have the defects repaired at our expense, for which we will pay the costs and charges upon demand.

Date:

Name of Contractor

By:_____
Signature
Print Name:
Title:

Representative of Contractor
to be Contacted for Service:

Name:

Address:

Telephone number of Contact:

18-ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between Owner , whose address is , and Contractor , whose address is , and Escrow Agent , whose address is .

For the consideration set forth in this Agreement, the Owner, Contractor, and Escrow Agent agree as follows:

1. Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by Owner pursuant to the Construction Agreement entered into between the Owner and Contractor for in the amount of $, dated (referred to as the "Construction Agreement"). Alternatively, on written request of Contractor, Owner shall make payments of the retention earnings directly to the Escrow Agent. When Contractor deposits the securities as a substitute for retention earnings, the Escrow Agent shall notify the Owner within 10 days of the deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Construction Agreement between the Owner and Contractor. Securities shall be held in the name of and shall designate the Contractor as the beneficial owner.

2. Owner shall make progress payments to Contractor for those funds which otherwise would be withheld from progress payments under the provisions of the Construction Agreement, provided the Escrow Agent holds securities in the form and amount specified above.

3. When Owner makes payments of retentions earned directly to the Escrow Agent, the Escrow Agent shall hold them for the benefit of Contractor until the time the escrow created under this Escrow Agreement is terminated. Contractor may direct investment of the payments into securities. All terms and conditions of this Escrow Agreement and the rights and responsibilities of the parties shall be equally applicable and binding when Owner pays the Escrow Agent directly.

4. Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account and all expenses of Owner. These expenses and payment terms shall be determined by Owner, Contractor, and Escrow Agent.

5. The interest earned on the securities or the money market accounts held in escrow, and all interest earned on that interest, shall be for the sole account of

Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the Owner.

6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from Owner to Escrow Agent that Owner consents to withdrawal of the amount sought to be withdrawn by Contractor.

7. Owner shall have a right to draw upon the securities in the event of default by Contractor. Upon seven days' written notice of the default to the Escrow Agent from Owner, Escrow Agent shall immediately convert the securities to cash and distribute the cash as instructed by Owner.

8. Upon receipt of written notification from Owner certifying that the work under the Construction Agreement is final and complete, and that Contractor has complied with all requirements and procedures applicable to the Construction Agreement, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all monies and securities on deposit and payment of fees and charges.

9. Escrow Agent shall rely on the written notifications from Owner and Contractor pursuant to Sections 6 to 8, inclusive, of this Escrow Agreement and Owner and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

10. The names of the persons who are authorized to give written notice or to receive written notice on behalf of Owner and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures, are as follows:

On behalf of Owner:	On behalf of Contractor:
Title	Title
Name Above [typed or printed]	Name Above [typed or printed]
_____	_____
Signature	Signature
Address:	Address:

On behalf of Escrow Agent:

Title

_____
Name Above [typed or printed]

_____
Signature

Address:

At the time the Escrow Account is opened, the Owner and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Escrow Agreement.

IN WITNESS WHEREOF, the parties have executed this Escrow Agreement by their proper officers on the date first set forth above.

Owner

Title Above

Name Above [typed or printed]

_____
Signature

Contractor

Title Above

Name Above [typed or printed]

_____
Signature

Escrow Agent

Title Above

Name Abive [typed or printed]

_____
Signature

19-SHOP DRAWING TRANSMITTAL

PROJECT TITLE/ BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

The procedure governing shop drawing submittals is contained in the Contract Documents. All requirements must be followed by the Contractor. Failure to comply with all requirements will constitute grounds for return of the shop drawing for proper resubmittal. The Contractor shall sequentially number each submittal, using this form.

Date: Submittal No.

From: To:

This is: an original submittal ☐
a 2nd submittal ☐
a [ ] submittal ☐

Subject of Submittal:

Material or Equipment Designation:

Specification Section(s):

Check either (a) or (b)

☐ (a) We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown (no exceptions).

☐ (b) We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown, except for the following deviations (List deviations on attached sheet).

The Contractor has reviewed and approved not only the field dimensions but the construction criteria and has also made written notation regarding any information in the shop drawings that does not conform to the Contract Documents. This shop drawing has been coordinated with all other shop drawings received to date by Contractor and this duty of coordination has not been delegated to subcontractors, material suppliers, the architect, or the engineers on this project.

_____
Signature of Contractor or Supplier

20-DRUG-FREE WORKPLACE CERTIFICATION

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

This Drug-Free Workplace Certification is required pursuant to Government Code Section 8350 and following sections, and the Drug-Free Workplace Act of 1990. The Drug-Free Workplace Act of 1990 requires that every person or organization awarded a contract for the procurement of any property or services from any state agency must certify that it will provide a drug-free workplace by doing certain specified acts. In addition, the Act provides that each contract awarded by a state agency may be subject to suspension of payments or termination of the contract and the contractor may be subject to debarment from future contracting, if the state agency determines that specified acts have occurred.

Pursuant to Government Code Section 8355, every person or organization awarded a contract from a state agency shall certify that it will provide a drug-free workplace by doing all of the following:

A. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the person's or organization's workplace, and specifying actions which will be taken against employees for violations of the prohibition;

B. Establishing a drug-free awareness program to inform employees about all of the following:

1. The dangers of drug abuse in the workplace;

2. The person's or organization's policy of maintaining a drug-free workplace;

3. The availability of drug counseling, rehabilitation, and employee-assistance programs;

4. The penalties that may be imposed upon employees for drug abuse violations;

C. Requiring that each employee engaged in the performance of work on the Project be given a copy of the statement required by subdivision (a), and that as a condition of employment on the Contract the employee agrees to abide by the terms of the statement.

I, the undersigned, agree to fulfill the terms and requirements of Government Code Section 8355 listed above and will publish a statement notifying employees concerning (a) the prohibition of controlled substances at the workplace, (b) establishing a drug-free awareness program, and (c) requiring that each employee engaged in the performance of the Contract be given a copy of the statement required by Section 8355(a) and requiring that the employee agree to abide by the terms of that statement.

I also understand that if the Owner determines that I have either (a) made a false certification or (b) violated this certification by failing to carry out the requirements of Section 8355, the contract awarded is subject to suspension of payments, termination, or both. I further understand that should I violate the terms of the Drug-Free Workplace Act of 1990, I may be subject to debarment in accordance with the requirements of Section 8350 and following sections.

I acknowledge that I am aware of the provisions of Government Code Section 8350 and following sections, and hereby certify that I will adhere to the requirements of the Drug-Free Workplace Act of 1990.

Name of Contractor

_____
Signature

Print Name Above

Print Title Above

Date:

22-CERTIFICATE OF ATTENDANCE AT MANDATORY JOB WALK

On projects including a mandatory job walk, this form must be submitted with the bid or bidder will be declared "non-responsive"

PROJECT TITLE/ BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

It is the Owner's intention to provide all contractors with equal access to information regarding this project. Further, the Owner has issued plans and specifications to bidders and has allowed bidders the opportunity to inspect the site with knowledgeable personnel at the job walk. Therefore it is understood that the Owner may declare the bid non-responsive for any of the following conditions:

1. If a bidder attends the entire mandatory job walk but fails to complete this form;

2. If a bidder fails to attend the entire mandatory job walk;

3. If a bidder fails to attend the entire mandatory job walk but certifies that he was in attendance. *[NOTE: This may also lead to a determination that the bidder is non-responsive.]*

Please check one of the following:

☐ I attended the entire mandatory job walk

–OR–

☐ I did not attend the entire mandatory job walk.

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

Executed at , California, on , 20 .

Firm Name:

By:
Print Name Above

Signed _____

Print Title:

23-CONTRACTOR'S QUALIFICATIONS QUESTIONNAIRE

TO BE SUBMITTED WITH THE BID WHEN THERE HAS BEEN NO PREQUALIFICATION PROCESS

PROJECT TITLE/BID #: PORTERVILLE COLLEGE MULTI-CULTURAL CENTER & INTERACTIVE GARDENS (STUDENT SERVICES)
OWNER: KERN COMMUNITY COLLEGE DISTRICT

The prospective Bidder shall furnish all the following information accurately and completely. Failure to fully and completely comply with this requirement may result in rejection of any bid submitted. Additional sheets may be attached if necessary. "You" or "your" as used in this questionnaire refers to the Bidder's firm and any of its owners, officers, directors, shareholders, parties, or principals. Owner has discretion to request additional information depending on the project.

—WARNING—

Certain information may lead to a determination of non-responsibility and rejection of the bid.

(1) Firm name and address:

(2) Telephone:

(3) Type of firm: (check one) Individual ☐ Partnership ☐ Corp. ☐

(4) License No.:
Class:
DIR Registration No.
Name of license holder:

(5) Have you or any of your principals ever been licensed under a different name or different license number? Response must include information pertaining to principals' association outside of the firm bidding this Project. If yes, give name and license number: .

(6) Names and titles of all principals of the firm:

(7) Number of years as contractor. Include only years in this type of construction and only the years with the current entity in its current form: Years

(8) Person who inspected work site for your firm:

Name:
Title:
Date of Inspection:

(9) Years of experience your firm has in public school construction work:

As general contractor: Years
As subcontractor: Years

(10) In the last five years has your firm or any of its principals defaulted so as to cause a loss to a surety? Response must include information pertaining to principals' associations outside of the firm bidding this Project. If the answer is yes, give date, name, and address of surety and details:

(11) In the last five years have you or any of your principals been assessed liquidated damages for any project? Response must include information pertaining to principals' associations outside of the firm bidding this Project. If yes, explain:

(12) In the last five years have you or any of your principals been in litigation or arbitration or a dispute of any kind on a question or questions relating to a public construction project? Response must include information pertaining to principals' association outside of the firm bidding this Project. If yes, provide name of public agency and details of the dispute. Attach additional pages as necessary.

(13) In the last five years have you or any of your principals ever failed to complete a project? Response must include information pertaining to principals' association outside of the firm bidding this Project. If yes, provide owner's name and details. Attach additional pages as necessary.

(14) In the last five years have you or any of your principals been assessed back-charges on any public works construction project? If so, explain, including the

identity of the public entity, the basis for their claims, and the final result. Attach additional pages as necessary.

(15) In the last five years have you or any of your principals ever failed to complete a project within the time frame originally set for completion, plus any extension of time granted for weather delays? An extension of time for any reason other than weather delays requires an explanation. Response must include information pertaining to principals' association outside of the firm bidding this Project. If yes, provide owner's name and details. Attach additional pages as necessary.

(16) List names, addresses, and telephone numbers of three architects or engineers with whom you have worked on a public works project in the last five years:

Project One:

Project Two:

Project Three:

(17) Conflicts of Interest: Do you now or have you in the last five years had any direct or indirect business, financial, or other connection with any official, employee, or consultant of the OWNER or architect? If yes, describe. Attach additional pages as necessary.

(18) In the last five years have you or any of your principals filed a claim for additional compensation from a public entity on a construction project? If yes, explain and include the identity of the public entity, the basis for the claim, the response by the public entity, and the final result. Attach additional pages as necessary.

(19) In the last five years have you or any of your principals ever failed to pre-qualify, or been deemed unqualified, on any public works construction project? If yes, explain and include the identity of the public entity, the basis for their claims, and the final result. Attach additional pages as necessary.

(20) In the last five years have you or any of your principals ever been declared a "non-responsible" bidder on any public works construction project? If yes, explain and include the identity of the public entity, the basis for their claims, and the final result. Attach additional pages as necessary.

(21) Staff/Roster Functions: List all members of your staff who will be assigned or responsible for work as a team member on this Project (except clerical) and show job titles, functions, years with firm, and projects completed for company. Include company officers, responsible managing employee (RME), project manager, and superintendent. Provide the following information for each individual (copy this page as many times as required).

Name and Title:

Function:

Years with firm:

Has the individual had prior exposure as a team member on one of your projects?

Yes ☐ No ☐

List of all school projects this person has completed for you:

Provide an organizational chart reflecting your proposed project team for the Project, including all persons on your project team.

(22) Surety: Indicate the names of all surety companies utilized by you in the last 10 years. Attach additional pages as necessary.

Surety Name & Address	Period Covered
Surety Name & Address	Period Covered
Surety Name & Address	Period Covered
Surety Name & Address	Period Covered

(23) Attach a notarized statement from surety company(ies) proposed to be utilized on this Project, indicating your total bonding capacity and certifying that:

A. Currently available bonding capacity exceeds the value of your contract, as estimated by the OWNER, and;

B. Surety(ies) will provide bonding of the project in the event you are awarded Project.

(24) Insurance: Provide a notarized statement from your workers' compensation carrier specifying your current "Experience Modification Rate" for workers' compensation for the State of California. Provide a list of above-referenced ratings and corresponding companies for the last five years.

(25) Safety:

A. Does your firm have a written Safety Program:

Yes ☐ No ☐ (If yes, attach copy.)

B. Does your firm have personnel permanently assigned to safety?

Yes ☐ No ☐ (If yes, provide names and duties.)

(26) Give the public entity's name, telephone number, and the name of the contact person for the three largest public works projects performed for a public entity, other than a school/college/university, that you have completed in the last five years: Attach additional sheets as necessary.

(27) List of References: Provide information on the three largest projects performed for a public school, college, or university in the last five years.

Contract 1:

Name:

Address:

Telephone:

Contact Person:

Type of construction project:

Dates of commencement and completion of construction project:

Contract amount:

Architect:

Architect's address:

Telephone:

DSA or public agency inspector:

Address:

Telephone:

Contract 2:

Name:

Address:

Telephone:

Contact Person:

Type of construction project:

Dates of commencement and completion of construction project:

Contract amount:

Architect:

Architect's address:

Telephone:

DSA or public agency inspector:

Address:

Telephone:

Contract 3:

Name:

Address:

Telephone:

Contact Person:

Type of construction project:

Dates of commencement and completion of construction project:

Contract amount:

Architect:

Architect's address:

Telephone:

DSA or public agency inspector:

Address:

Telephone:

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

Executed this day of , 20 , at (City, County), State of .

_____
Signature

Print Name Above

Print Title Above

SECTION 011100
SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and drawing conventions.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification:

Porterville College Student Building
100 E. College Ave.
Porterville, CA 93257

Architect’s Project Number: 22-12500

B. Owner:

Kern Community College District
2100 Chester Ave.
Bakersfield, CA 93301

Telephone: 661-336-5100
Contact: Daniel Reed

C. Architect:

TETER, LLP
7535 North Palm Avenue, Suite 201
Fresno, California 93711

Telephone 559.437.0887
Contact: Steven Polanco

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of the following:

1. The project consist of an approximately 1,400 s.f. new Student Services building with a community center, offices and support spaces. The building construction type is a Type V-B and will not have fire sprinklers throughout the building.

B. Type of Contract: Project will be constructed under a single prime contract.

1.5 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.6 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or

used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.7 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except as otherwise indicated.

1. Submit a written request to the Architect for work hours outside of the indicted on-site hours; request subject to review by the Owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect and Owner not less than 2 days in advance of proposed utility interruptions.
2. Obtain Architect’s and Owner’s written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Architect and Owner not less than 2 days in advance of proposed disruptive operations.
2. Obtain Architect’s and Owner’s written permission before proceeding with disruptive operations.

E. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed with by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 011103
ADDENDA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Addenda issued prior to bid and award of the Contract.

B. Related Requirements:

1. Division 00 Sections as applicable to contract requirements and modifications.
2. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 NOTICE TO BIDDERS

A. Addenda will be issued to registered plan holders for changes to the drawings and specifications during the bidding period prior to the award of the contract. Addenda shall serve to clarify, revise, and supersede information in the Project Manual, Drawings, and previously issued Addenda. Portions of the Addenda affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.

B. The Bidder shall acknowledge receipt of this Addendum in the appropriate space on the Bid Form.

1.4 GOVERNING AGENCY REVIEW AND APPROVAL

A. Addenda shall be submitted to the Division of the State Architect (DSA) by the project Architect. Addenda shall be approved by DSA prior to incorporation into the construction documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 011105
USE OF ARCHITECT'S ELECTRONIC FILES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes Administrative and procedural requirements for use of Architect's electronic files.

B. Related Sections:

1. Division 01 Section "Project Management and Coordination."
2. Division 01 Section "Submittal Procedures."
3. Division 01 Section "Project Record Drawings."

1.3 USE OF ARCHITECT'S ELECTRONIC FILES

A. Architect may make available to Contractor digital data files of Architect's Drawings for use in preparing shop drawings, coordination drawings, and project record drawings.

1. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
2. Files will be supplied on a CD ROM diskette, DWG format, which shall be returned to the Architect at the end of the Project with the Project Close-out Documents.
3. The cost of the CD ROM shall be as indicated on the "ELECTRONIC DATA FILE DISTRIBUTION WAIVER OF LIABILITY FORM" included at the end of this Specification Section. The cost shall be paid by direct payment to the Architect and shall be attached to the Waiver of Liability Form at the time of request.

B. Contractor, Subcontractors, and Suppliers of this Project shall jointly execute a waiver of Liability for each use of the Architects electronic files and shall be responsible for the use of electronic files.

1. Liability Form: "ELECTRONIC DATA FILE DISTRIBUTION WAIVER OF LIABILITY FORM" included at the end of this Specification Section.

C. The use of the electronic files shall only be used for this Project and for the identified purposes noted on the "ELECTRONIC DATA FILE DISTRIBUTION WAIVER OF LIABILITY FORM." The CD ROM or any files contained on it shall not be duplicated without written permission of the Architect.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

(Electronic Data File Distribution Waiver of Liability included on the following page.)

TETER, LLP
ARCHITECTS ENGINEERS CONNECTED

ELECTRONIC DATA FILE DISTRIBUTION WAIVER OF LIABILITY

TETER, LLP
7535 North Palm, Suite 201
Fresno, California 93711

Project: _____

Intended Use: _____

Any electronic data, files or information provided under this Agreement are the property of the above listed Professionals and consultants (Team). It is understood and agreed that the information contained in these electronic data file shall not be copied or duplicated for any use other than the project for which they were created. It is understood by the undersigned that compatibility of this electronic media with other systems is not guaranteed, and conversion to other systems is done at the user's own risk.

The user hereby agrees and recognizes that designs, plans and data stored on electronic media including, but not limited to, computer disk and magnetic tape, may be subject to undetectable alteration and/or uncontrollable deterioration. It is agreed by the undersigned that the Team shall not be liable for the completeness or accuracy of any material provided on electronic media.

The undersigned agrees to defend, hold harmless and indemnify the Team and its officers, directors, employees, agents and consultants for any and all claims, losses, costs or damage whatsoever arising out of, resulting from, or in any way related to the use of electronic data files provided hereunder, whether that use is authorized or unauthorized. The user further agrees to defend, indemnify and hold harmless the Team its officers, directors, employees, agents and consultants from any and all claims, damages, losses, expenses and injuries arising out of the modification of the electronic data files by the user or by anyone obtaining said files through or from the user.

The Team bears no responsibility for the information in the electronic data files once it leaves the offices of **TETER**, LLP. The undersigned understands that the electronic data files is subject to applicable copyright laws of the United States and agrees to be bound by same. Upon our receipt of this agreement duly executed by an Officer of your firm you may request the Data files on CD for a fee of $200.

Name (Print/Sign): _____ Date: _____

Firm: _____ _____

Phone and email: _____ _____

Name (Print/Sign): _____ Date: _____

Firm: _____ _____

Phone and email: _____ _____

Name (Print/Sign): _____ Date: _____

Firm: _____ _____

Phone and email: _____ _____

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:

1. Division 00 Section “Instructions to Bidders” and other Division 00 Sections as applicable to substitution requests prior to submission of bids.
2. Division 01 Section “DSA Hourly Fee Services” for DSA hourly fee services for review of changes to DSA approved Construction Documents.
3. Division 01 Section “Contract Modification Procedures” for changes to DSA approved Construction Documents.”
4. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
5. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor that are not required in order to meet other Project requirements but may offer advantage to the Owner.

1.4 REGULATORY REQUIREMENTS

A. Division of the State Architect (DSA) Review and Approval: Substitutions resulting in changes to DSA approved Construction Documents may be considered a change requiring DSA review and approval and submission of a DSA Construction Change Document (CCD) form by the Architect.

1. DSA Construction Change Documents shall be as specified in Division 01 Section “Contract Modification Procedures.”
2. DSA Hourly Fee Services for review of CCD’s shall be as specified in Division 01 Section “DSA Hourly Fee Services.”

1.5 SUBMITTALS

A. Substitution Requests: Submit four (4) paper copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form provided at the end of this Section.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

    a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. Certificates and qualification data, where applicable or requested.
    g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
    j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
    k. Cost information, including a proposal of change, if any, in the Contract Sum.
    l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later. Architect will not act on any Post-Bid Substitutions until 7 days following the submission of the Schedule of Values per Division 01 Section “Payment Procedures.”

a. Forms of Acceptance:

1) Substitutions Prior to Bid: Addenda will be issued for substitutions accepted prior to bid.
2) Substitutions After Award of Contract: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.6 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.7 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions Prior to Bid: Architect will consider requests for substitution if received within 21 days prior to the submission of bids. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider bidder’s request for substitution when the following conditions are satisfied.

a. Substitutions prior to bid shall also be subject to the requirements of applicable Division 00 Specification Sections.

b. Substitutions prior to bid shall comply with the requirements for Substitutions for Cause or Substitutions for Convenience as applicable.

2. Substitutions requested by bidders during the bidding period, and accepted by Addendum prior to award of the Contract, are considered as included in the Contract Documents.

B. Substitutions After Award of Contract: The Contractor after award of the Contract, as allowed by the General Conditions, may submit materials and methods to be considered for substitutions.

1. The following are not considered to be substitutions:

a. Revisions to the Contract Documents requested by the Owner or Architect.
b. Specified options of products and construction methods included in the Contract Documents.
c. The Contractor's compliance with governing regulations and orders issued by governing authorities.

C. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 21 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

D. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied,

Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

(Substitution Request Form included on the following page.)

TETER, LLP
ARCHITECTS ENGINEERS CONNECTED

SUBSTITUTION REQUEST FORM

PROJECT:_____

We hereby submit for your consideration the following product instead of the specified item for the above project:

SECTION	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____

Proposed Substitution: _____

Attach complete technical data, including laboratory tests, if applicable.

Include complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proposed installation.

Fill in the blanks below:

A. Does the substitution affect dimension on Drawings:

_____

B. Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?

_____

C. What affect does substitution have on other trades?

_____

D. Difference between proposed substitution and specified item?

_____

E. Manufacturer's guarantees of the proposed and specified items are:

_____ Same _____ Different (explain on attachment)

F. Cost difference between proposed substitution and specified item - savings to Owner?

_____

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item and will be at no additional cost to the Owner.

Submitted to the Architect by:

Signature: _____

Firm: _____

Address: _____

_____

Date: _____

Telephone: _____

For Use by Design Consultant

Accepted _____
Accepted as Noted _____
Not Accepted _____
Received Too Late _____

By: _____

Date: _____

Remarks: _____

SECTION 012600
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Division of the State Architect (DSA) Interpretation of Regulations IR A-6 “Construction Change Document Submittal and Approval Process,” latest edition (This document is available on DSA’s website).

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications including the following:

1. Governing Agency requirements.
2. Architect’s Supplemental Instructions.
3. Architect’s Change Directive.
4. Proposal Requests.
5. Change Orders.

B. Related Requirements:

1. Division 00 Sections as applicable to contract requirements and modifications.
2. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
3. Division 01 Section “DSA Hourly Fee Services” for fees charged by DSA for changes to the Construction Documents.

1.3 DEFINITIONS

A. Contract Modification: A change to the Contract Agreement between the Owner and the Contractor affecting the Contract Documents, the Contract Time, and/or the Contract Amount.

B. Change Order (CO): A document defining Contract Modifications. Change Orders shall be issued by the Architect and shall be signed by the Architect, Owner, and Contractor.

C. Construction Change Document (CCD): A form required by DSA for documentation of changes to the DSA approved Construction Documents.

D. Architect's Change Directive (ACD): A form utilized by the Architect directing the Contractor to proceed with a change that may or may not require DSA approval.

E. Architect's Supplemental Instruction (ASI): For minor changes in the Work not involving adjustment to the Contract Sum or the Contract Time, the Architect will issue Architect's Supplemental Instructions authorizing such changes.

1.4 CHANGES TO GOVERNING AGENCY APPROVED CONSTRUCTION DOCUMENTS

A. Governing Agency Review and Approval: Changes to the Construction Documents are subject to review and approval by the authorities having jurisdiction.

1.5 CHANGES TO DSA APPROVED CONSTRUCTION DOCUMENTS

A. Division of the State Architect: For projects under the jurisdiction of the Division of the State Architect (DSA), Changes to the Construction Documents shall be reviewed and approved by DSA. Changes to the Construction Documents shall be submitted to DSA by the Architect, submittals for changes shall include DSA Form 140 "Application for Submittal of Post-Approval Document."

B. DSA Hourly Fee Services: Changes to DSA approved Construction Documents shall be reviewed by DSA and shall be subject to DSA Hourly Fee Services. Charges will be made to the Owner by DSA.

1. Where changes to DSA approved Construction Documents are the result of actions by the Contractor, the Contractor shall be liable for DSA Hourly Fee Services as described in Division 01 Section "DSA Hourly Fee Services."

1.6 ARCHITECT'S SUPPLEMENTAL INSTRUCTION

A. Architect's Supplemental Instruction (ASI): For minor changes in the Work not involving adjustment to the Contract Sum or the Contract Time, the Architect will issue Architect's Supplemental Instructions authorizing such changes.

1. Architect's Supplemental Instructions affecting changes to the Construction Documents shall be subject to governing agency review and approval, and shall be accompanied by appropriate DSA CCD documentation.
2. Contractor's Response:

    a. Contractor shall perform the work indicated in the Architect's Supplemental Instruction without adjustment to the Contract Sum or the Contract Time.
    b. If the Contractor determines that an adjustment to the Contract Sum or the Contract Time is necessary due to the Architect's Supplemental Instruction, the Contractor shall respond to the Architect's Supplemental Instruction as if it were an Architect/Owner initiated Proposal Request.

1.7 ARCHITECT'S CHANGE DIRECTIVE

A. Architect's Change Directive (ACD): Architect may issue an Architect's Change Directive on Architect's standard form to instruct Contractor to proceed with a change in the Work for subsequent inclusion in a Change Order.

1. Architect's Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
2. Architect's Change Directives affecting structural, fire/life safety, and/or access compliance shall be accompanied by appropriate approved DSA CCD documentation.
3. Architect's Change Directive shall be issued by the Architect and shall be signed by the Architect.

B. Documentation by Contractor: Maintain detailed records on a time and material basis of work required by the Architect's Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.8 PROPOSAL REQUESTS

A. General: Proposal Requests allow the Contractor to respond to proposed changes in the Work that involve an adjustment to the Contract Sum or the Contract Time. Proposal Requests are not instructions to stop work in progress or execute proposed changes. Upon Owner's approval of a Proposal Request, Architect will issue a Change Order instructing the Contractor to proceed with the proposed changes (Refer to Part 1 Article "Change Order Procedures").

B. Architect/Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Contractor's Response: Within time specified in Proposal Request, or not more than 7 days after receipt of Proposal Request when not otherwise specified, 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. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use forms acceptable to Architect.

C. Contractor-Initiated Proposals: If conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect. Architect will not act on any Contractor Initiated Proposals until 7 days following the submission of the Schedule of Values per Division 01 Section “Payment Procedures.”

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. 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.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. 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. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

D. Architect’s Response: Within 7 days after receipt of Contractor’s response to Architect/Owner initiated Proposal Request or Contractor’s Proposal, Architect will:

1. Issue a Change Order for accepted proposals.
2. Notify the Contractor of unaccepted proposals.
3. Issue an Architect’s Change Directive where changes are necessary for the progress of the Work and changes to the Contract Sum and the Contract Time are in dispute.

1.9 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on form provided by Architect.

1. Change Orders affecting changes to the Construction Documents shall be subject to governing agency review and approval, and shall be accompanied by appropriate DSA CCD documentation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012605
DSA HOURLY FEE SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Division of the State Architect (DSA) Interpretive Regulation IR A-30 “DSA Hourly Fee Services” latest edition (Document is available on DSA’s website).

https://www.dgs.ca.gov/-/media/Divisions/DSA/Publications/interpretations_of_regs/IR_A-30_rev01-31-19.ashx?la=en&hash=ADDE6E818F93CBA899CCC360AEE2A7EB7CA43FA2

1.2 SUMMARY

A. Section includes administrative and procedural requirements for DSA Hourly Fee Services associated with changes to DSA approved Construction Documents.

B. Related Requirements:

1. Division 00 Sections as applicable to contract requirements and modifications.
2. Division 01 Section "Addenda"
3. Division 01 Section "Substitution Procedures"
4. Division 01 Section "Contract Modification Procedures"
5. Division 01 Section "Payment Procedures"
6. Division 01 Section "Submittal Procedures"
7. Division 01 Section "Product Requirements"

1.3 DSA HOURLY FEE SERVICES

A. General: Changes to DSA approved Construction Documents shall be documented by the use of DSA Construction Change Document (CCD) forms. CCD forms shall be submitted to DSA by the Architect.

1. Refer to Division 01 Section “Contract Modification Procedures” for additional information regarding DSA CCD’s.

B. DSA Hourly Fee Services: Changes to DSA approved Construction Documents shall be reviewed by DSA and shall be subject to DSA Hourly Fee Services for review at a rate established by DSA IR A-30. Charges will be made to the Owner by DSA.

1. Hourly Rate: Rate per hour as established by DSA IR A-30, latest edition.

C. Bidder's Responsibility: Prior to bidding, where a bidder's request for substitution or similar action results in a change requiring DSA Hourly Fee Services, bidder shall submit a deposit to the Architect for reimbursement for DSA Hourly Fee Services. The deposit amount shall be established by the Architect, a minimum of one hour of DSA Hourly Fee Services (hourly rate as established by DSA IR A-30) will not be refundable. Deposits shall be made payable to the Owner.

D. Contractor's Responsibility: When a contractor's action results in a change requiring DSA Hourly Fee Services, charges by DSA to the Owner will be deducted from the Contract Sum and the Architect will issue a Change Order on a quarterly basis to adjust the Contract Sum.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012613
REQUEST FOR INFORMATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural provisions for preparation, submittal and response to Contractor's Request for Information (RFI's) during construction of project.

B. Related Sections:

1. General Conditions of the Contract.

1.3 DEFINITIONS

A. PDF, Portable Document Format: An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

B. RFI, Request for Information: Request from Contractor seeking information required by or clarification of the Contract Documents.

1.4 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Submit RFI's via email as PDF electronic files. Architect will not act on any RFI's until 7 days following the submission of the Schedule of Values per Division 01 Section "Payment Procedures."

1. RFI Form: Use RFI form included at end of this Section or form acceptable to Architect. Upon request from the Contractor, the form at the end of this section will be made available in WORD format from the Architect.
2. Attachments: Attachments shall be in PDF electronic file format.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow 10 working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor’s means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

4. Distribution: One electronic copy of each completed RFI review shall be distributed by the Architect to the Contractor and the Owner.

D. Regulatory Requirements: Architect's responses that modify the Contract Documents affecting Structural Safety, Fire and Life Safety, and/or Access Compliance shall be submitted to the Division of the State Architect for review and approval.

1. Changes to DSA approved Construction Documents shall be as specified in Division 01 Section "Contract Modification Procedures."

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the sequential RFI number. Submit log weekly unless otherwise directed in writing by Architect. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within 7 days if Contractor disagrees with response.

G. Contractor's Expense for RFI's: Architect will review and respond to legitimate RFI's at no additional cost to the Contractor. RFI's determined by the Architect to be flagrant or unnecessary will have the expense for the Architect's time paid by the Owner with the amount being deducted from the Contract Sum. The expense will be based on an hourly rate in accordance with the Architect's standard hourly rate schedule in effect at the time the work is performed with a minimum of one hour for each flagrant or unnecessary RFI.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

(REQUEST FOR INFORMATION form included on the following page.)

TETER
ARCHITECTS ENGINEERS CONNECTED

REQUEST FOR INFORMATION

Project:

_____
_____
_____
_____

From:

_____
_____

To:

_____
_____

TETER

Client Project No.

DSA File No.

DSA Appl No.

Date:

Request for Information No. _____

☐ Deviation from Contract Docs

☐ Correction of Non-Compliant Work

Drawing:_____

Detail No._____

Specification:_____

Addendum:_____

Respond by:

Priority
(Low) 1 2 3 4 5 (High)

Subject: _____

Information Requested:

Contractor's Recommendation:

Probable Cost Effect: _____ Probable Time Effect: _____

Architect's Response:

Disclaimer
The work shall be carried out in accordance with the above supplemental instructions pursuant the Contract Documents, without change in the Contract Sum or Contract Time. Proceeding with the Work, according to these instructions, indicates your acknowledgement that there will be no change in the Contract Sum or Contract Time. If the Contractor considers that this response requires a change in the Contract Sum or Contract Time, the Contractor shall not proceed with this Work and shall promptly submit an item proposal.

SECTION 012900
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
3. Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 DEFINITIONS

A. Schedule of Values: 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.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with continuation sheets.
b. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the Schedule of Values to Architect at earliest possible date but no later than 7 days before the date scheduled for submittal of initial Applications for Payment.

    a. Architect will not act on any RFI's, Post-Bid Substitutions, and/or changes to the project scope, cost, or schedule until 7 days following the submission of the Schedule of Values.

3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values correlated with each element.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. 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.

2. 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 of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of 5 percent of Contract Sum.

    a. Include separate line items under Contractor and principal subcontracts for project closeout requirements in an amount totaling 5 percent of the Contract Sum and subcontract amount.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. 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 required, include evidence of insurance.

6. 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.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. 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.

8. Schedule Updating: 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.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

    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: The date for each progress payment application shall be as indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

    1. If dates and periods are not indicated in the Agreement between Owner and Contractor at time of bidding, the date for Application for Payment shall be established by the Owner to correspond with the Owner’s administrative procedures in order to allow for processing and approval of Application for Payment. The period of construction work covered by each Application for Payment shall be one month.
    2. Submit draft copy of Application for Payment 7 days prior to due date for review by Architect.

C. Application for Payment Forms: Use forms acceptable to Architect and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Materials previously stored and included in previous Applications for Payment.
    b. Work completed for this Application utilizing previously stored materials.
    c. Additional materials stored with this Application.
    d. Total materials remaining stored, including materials with this Application.

F. Transmittal: Submit 6 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: 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.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. 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. Submittal schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
7. Initial progress report.
8. Report of preconstruction conference.

I. Application for Payment at Substantial Completion: After issuance of the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portions of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, 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. Updated final statement, accounting for final changes to the Contract Sum.
3. Evidence that claims have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION(Not Used)

END OF SECTION

SECTION 013113
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.

B. Related Sections:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 SUBMITTALS

A. List of Key Personnel Names: Within 14 calendar days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

B. Coordination Drawings:

1. Initial Submittal: Submit 3 printed copies of each coordination drawing for each condition where Coordination Drawings are required.
2. Project Closeout:

a. Submit 3 printed “Record” copies of each coordination drawing for each condition where Coordination Drawings are required.
b. Submit “Record” electronic coordination drawing files.

1.4 COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. 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.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

PART 2 - PRODUCTS

2.1 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity. Coordination Drawings shall include the work of multiple trades on the same drawing. Prepare Coordination Drawings in addition to Shop Drawings required in individual Sections.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawings, Required: Coordination drawings shall include plans, elevations, sections, and details of the Work for each trade as required to adequately represent the work. Clearly indicate and identify conflicts between components for review by Architect. Provide Coordination Drawings as follows:

1. Overhead Work and Work Above Finished Ceilings: Include subframing for support of ceiling and wall systems, conduit and piping runs, plumbing, mechanical, and electrical equipment, and related Work. Locate components to accommodate layout of light fixtures indicated on Drawings. Show the work of each trade including, but not limited to, pipe runs, mechanical ductwork, cable trays, conduit runs, and bracing and supports.

a. Indicate locations of all dampers, valves, cleanouts and other devices requiring human access for maintenance and repair. Where access panels are required, show locations and indicate size.
b. Show the height above finish floor each item, demonstrating sufficient space for installation and maintenance. Indicate sizes of ducts, piping and similar items.
c. Layout of work shall be done in such a manner to avoid conflicts between the work of different trades, finish ceiling heights, soffits, light fixtures or other finish work at ceilings and soffits.
d. Should unavoidable conflicts occur that affect finish ceiling and soffit heights, methods of installations, methods of construction or means of accessibility, the contractor shall clearly identify each location for review by the Architect.

2. Equipment Rooms and Outdoor Service Yards: Show work above and below grade including mechanical, plumbing, fire protection, fire alarm, and electrical equipment, and related supports, accessories, and utility connections. Include the following information:

a. Equipment: Show equipment and locations, utility connections, and working and service clearances.
b. Utilities: Show above and below grade utilities; indicate heights and below grade elevations, sizes of piping and conduit, dimensions between utilities and between utilities and other obstructions including concrete footings for other work. Show locations of all shut-off and isolation valves, cleanouts, filters, and other devices requiring human access for maintenance and repair.
c. Enclosures: Show limits of enclosure including walls, doors, fences, and gates; confirm door and gate access width for equipment.
d. Dimensions: Indicate dimensions as appropriate to insure adequate clearance will be provided for installation, service, and operation of equipment; include horizontal and vertical dimensions between utilities to insure clearance for installation of utilities. Include vertical dimension(s) of equipment and distances to overhead obstructions where applicable.

3. Roof Mounted Equipment: Show equipment that will be located on the roof, include the following:

a. Equipment locations and horizontal distances between equipment.
b. Locations of roof penetrations, sizes of penetrations, and indicate the horizontal distance between penetrations and roof mounted equipment.
c. Pipe and conduit runs including locations and type(s) of supports.
d. Distance between all roof mounted equipment and roof drainage features. Equipment shall be located so as to not obstruct roof drainage; provide at least 24 inches between equipment platforms and valleys formed by the intersection of roof planes and crickets.

4. Underground Site Utilities and Utilities Below Slabs on Grade within Building Areas: Where underground utilities cross other utilities, penetrate footings, underground structures or other obstructions; show the work that will be placed underground; include the following information:

a. Indicate types and sizes of utility piping and elevations below grade.
b. Show footings and other underground structures; where unavoidable conflicts occur between underground structures/footings and utilities, indicate depths below grade and clearly identify locations for sleeving for review by Architect.

C. Preparation: Prepare coordination drawings electronically using same digital data software program, version, and operating system as the Architect's original Drawings (DWG files).

1. Submittal Format:

a. Electronic Format: Submit electronic drawing files using Portable Data File (PDF) format.
b. Printed Format: Submit plotted drawings on opaque bond paper not of at least 8.5 inches by 11 inches and not larger than 24 inches by 36 inches.

2. Architect will furnish Contractor digital data files of base drawings as appropriate for use in preparing coordination digital data files.

a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to the Drawings.
b. Digital Data Software Program: The Drawings are available in DWG format.
c. Contractor shall execute a data licensing agreement in the form of an Agreement form acceptable to the Owner and Architect.

D. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Architect determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Architect will so inform the Contractor, who shall make changes as directed and resubmit.

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Examination of Conditions: Require the Installer of each major component to examine both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.

C. 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.

END OF SECTION

SECTION 013119
PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Preinstallation conferences.
3. Progress meetings.
4. Project Closeout Conference.

B. Related requirements include but are not limited to the following:

1. Division 01 Sections as applicable to project management.

1.3 PRECONSTRUCTION CONFERENCE

A. Preconstruction Conference: Schedule a preconstruction conference before starting construction at the project site, at a time convenient to the Owner, Inspector of Record, and the Architect, but no later than 14 days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Owner and Architect to conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent shall attend the conference. Major subcontractors and other concerned parties shall be invited to attend the conference, but attendance is not mandatory. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including but not limited to the following:

1. Tentative construction schedule.
2. Critical work sequencing and long-lead items.
3. Designation of key personnel and their duties.
4. Lines of communication.
5. Procedures for processing field decisions and Change Orders.
6. Procedures for processing Applications for Payment.

7. Procedures for RFI’s.
8. Procedures for testing and inspection.
9. Submittal procedures.
10. Sustainability requirements including construction waste management and disposal.
11. Preparation of record documents.
12. Use of the premises.
13. Work restrictions and working hours.
14. Temporary facilities and controls.
15. Parking availability.
16. Office, work, and storage areas.
17. Equipment deliveries and priorities.
18. Safety procedures and first aid.
19. Security.
20. Housekeeping.
21. Owner’s alcohol, drug and tobacco policy.

D. Minutes: Contractor shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Inspector of Record, and Architect, within three days of the meeting.

1.4 PREINSTALLATION CONFERENCES

A. Preinstallation Conferences: Conduct a preinstallation conference at the Project Site before each construction activity that requires coordination with other construction.

B. Attendees: Installers 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 the Owner, Inspector of Record, and Architect of scheduled meeting dates.

C. Agenda: Review the progress of other construction activities and preparations for the particular activity under consideration at each preinstallation conference, including requirements for the following:

1. Contract Documents.
2. Options.
3. Related RFI’s, Proposal Requests, and Change Orders.
4. Purchases.
5. Deliveries.
6. Submittals.
7. Sustainability requirements.
8. Possible conflicts.
9. Compatibility problems.
10. Time schedules.
11. Weather limitations.
12. Manufacturer's written instructions.
13. Warranty requirements.
14. Compatibility of materials.
15. Acceptability of substrates.

16. Temporary facilities.
17. Space and access limitations.
18. Regulations of authorities having jurisdiction.
19. Safety.
20. Testing and ionspecting requirements.
21. Required performance results.
22. Recording requirements.
23. Protection.
24. Record significant conference discussions, agreements, disagreements, including corrective measures and actions.
25. Promptly distribute minutes of the meeting to each party present and to other parties requiring information, including the Owner and the Architect.
26. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

D. Minutes: Contractor shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Inspector of Record, and Architect, within three days of the meeting.

1.5 PROGRESS MEETINGS

A. Progress Meetings: Conduct progress meetings at the Project Site at regular intervals to be established by the Architect, Inspector of Record, Contractor, and Owner.

1. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and Architect, each 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. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Attendees: In addition to representatives of the Owner and Architect, each 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. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

D. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project. Review proposed percentages of work completed for current months progress payment.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including the following:

    a. Interface requirements.
    b. Sequence of operation.
    c. Status of submittals.
    d. Status of Sustainability documentation.
    e. Deliveries.
    f. Off-site fabrication.
    g. Access.
    h. Site utilization.
    i. Temporary facilities and services.
    j. Status of correction of deficient items.
    k. Field observations.
    l. Status of RFI's, Proposal Requests, and Change Orders.
    m. Progress cleaning.
    n. Quality and work standards.
    o. Documentation of information for payment requests.
    p. Request for Information

E. Minutes: Contractor shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Inspector of Record, and Architect, within three days of the meeting.

F. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule to the Owner, the Architect, and all other parties involved in the project. Failure to revise and keep current the Contractor's construction schedule may be grounds for returning Application for Payment unreviewed.

1.6 PROJECT CLOSEOUT CONFERENCE

A. Project Closeout Conference: Conduct a project closeout conference, at a time convenient to Owner and Architect, but not less than 90 days prior to the scheduled date of Substantial Completion. Conduct the conference to review requirements and responsibilities related to Project closeout.

B. Attendees: Authorized representatives of Owner, Architect and their consultants; Contractor and its superintendent. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

1. Preparation of record documents.
2. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
3. Submittal of written warranties.
4. Requirements for completing Sustainability documentation.
5. Requirements for preparing operations and maintenance data.

6. Requirements for delivery of material samples, attic stock, and spare parts.
7. Requirements for demonstration and training.
8. Preparation of Contractor's punch list.
9. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
10. Submittal procedures.
11. Responsibility for removing temporary facilities and controls.

D. Minutes: Contractor shall record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Inspector of Record, and Architect, within three days of the meeting.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 013200
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Special reports.

B. Related Sections include but are not limited to the following:

1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
2. Division 01 Section "Quality and Testing Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Milestone: An activity, which occurs in an instant and thus has no time duration, a key or critical point in time for reference or measurement.

1.4 SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit electronic copy of schedule labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Meetings." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Discuss constraints, including work stages, area separations, interim milestones, Owner occupancy.
2. Review delivery dates for Owner-furnished products.
3. Review schedule for work of Owner's separate contracts.
4. Review submittal requirements and procedures.
5. Review time required for review of submittals and resubmittals.
6. Review requirements for tests and inspections by independent testing and inspecting agencies.
7. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
8. Review and finalize list of construction activities to be included in schedule.
9. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules with performance of construction activities and with scheduling of separate contractors.

B. Coordinate Contractor's construction schedule with the submittal schedule and other required schedules.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Completion: Indicate completion in advance of date established for completion, and allow time for Architect's administrative procedures necessary for certification of completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Submittals.
    b. Purchases.
    c. Mockups.
    d. Fabrication.
    e. Sample testing.
    f. Deliveries.
    g. Installation.
    h. Tests and inspections.
    i. Adjusting.
    j. Curing.
    k. Startup and placement into final use and operation.

7. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.
    d. Completion of mechanical installation.
    e. Completion of electrical installation.
    f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing
j. Commissioning.
k. Punch list and final completion.
l. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.

5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.3 SPECIAL REPORTS

A. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At progress meetings, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, Inspector of Record, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 013233
PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.

B. Related Sections:

1. Division 01 Section “Project Meetings.”
2. Division 02 Section "Selective Demolition" for photographic documentation before building demolition operations commence.
3. Division 31 Section "Site Clearing" for photographic documentation before site clearing operations commence.

1.3 SUBMITTALS

A. Digital Photographs: Submit image files at regularly scheduled progress meetings.

1. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

C. Preconstruction Photographs: Before commencement of excavation, commencement of demolition, or starting construction, take photographs of Project site and surrounding area, including existing items to remain during construction, from different vantage points as necessary to document preconstruction conditions.

1. Take not less than 20 photographs to show existing conditions adjacent to Project area before starting the Work.
2. Take not less than 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take not less than 20 photographs bi-weekly, with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

END OF SECTION

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
3. Cost for multiple resubmittals.

B. Related Sections:

1. Division 01 Section “Payment Procedures” for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Project Management and Coordination" for submitting coordination drawings.
3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Division 01 Section "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and final completion construction photographs.
5. Division 01 Section "Quality and Testing Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
6. Division 01 Section "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
7. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
8. Division 01 Section "Project Record Documents" for submitting record Drawings.
9. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the

Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Name of subcontractor.
    d. Description of the Work covered.
    e. Scheduled date for Architect's final release or approval.
    f. Scheduled dates for purchasing.
    g. Scheduled date of fabrication.
    h. Scheduled dates for installation.
    i. Activity or event number.

1.4 SUBMITTAL PROCEDURES

A. General: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.
2. Architect will not review submittals received from sources other than the Contractor.

B. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using transmittal form.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate timing of submitting submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review related submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 14 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 14 calendar days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 calendar days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 14 calendar days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

    a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

E. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

F. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

G. Use for Construction: Retain complete copies of submittals on Project site. Use only final submittals that are marked with acceptable notation from Architect's action stamp.

1.5 SUBMITTAL REQUIREMENTS

A. General: Assemble each submittal individually and appropriately for transmittal and handling.

B. Format: Prepare submittals as paper or electronic submittals as directed by Architect.

1. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

    a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

2. Paper Submittals: Prepare submittals in paper form as a package, incorporating complete information into each package. Name package with submittal number and submit two (2) paper copies of each submittal to Architect unless otherwise indicated. Architect will return one (1) copy.

C. Submittal Cover Page: On the submittal cover page, or first page, include title block and/or identifying information as follows:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
8. Category and type of submittal.
9. Submittal purpose and description.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.
17. Space for Architect’s review stamp of not less than 4 inches wide by 3-1/2 inches high on or beside title block to record Architect’s review stamp and action taken by Architect.
18. Space for Contractor’s review/approval stamp of size required by contractor, approximately 3 inches by 3 inches, on or beside title block to record Contractor's review and approval.

D. Product Options:

1. Clearly identify options requiring selection by Architect.
2. Clearly identify product options required to comply with the Contract Documents.

E. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and

limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

F. Field Conditions: Indicate field conditions where applicable to the work associated with the submittal.

G. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. One (1) electronic pdf copy unless otherwise indicated.

H. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.

e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, prepare Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

3. Submit Shop Drawings in the following format:

a. Two opaque (bond) copies of each submittal. Architect will return one copy.

1) If requested by Architect, submit one (1) electronic pdf copy.

I. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

3. Transmittal: Transmit by one of the following methods as directed by Architect:

a. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
b. Paper Transmittal: Include paper transmittal including complete submittal information indicated.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three (3) sets of Samples. Architect will retain two (2) Sample sets; remainder will be returned.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.

J. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

L. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

M. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign

documents on behalf of that entity. Provide a notarized signature where indicated.

2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

    a. Name of evaluation organization.
    b. Date of evaluation.
    c. Time period when report is in effect.
    d. Product and manufacturers' names.
    e. Description of product.
    f. Test procedures and results.
    g. Limitations of use.

1.6 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit six (6) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.7 CONTRACTOR'S REVIEW

A. Contractor’s Review of Submittals: Contractor shall review each submittal for completeness, compliance with the Contract Documents, and coordination with other Work of the Contract.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.
2. Contractor’s approval stamp shall certify the following actions by the Contractor:

    a. Field measurements have been determined, verified, and indicated on submittal.
    b. Field conditions have been verified and coordinated with Work associated with the submittal.
    c. The Work associated with the submittal is in conformance with the Contract Documents.
    d. Work being performed by various subcontractors and trades is coordinated with Work associated with the submittal including work being performed by others for the Owner.
    e. Deviations from the Contract Documents are identified and notes.

1.8 ARCHITECT'S REVIEW AND ACTION

A. Architect’s Review of Submittals: Architect will review each submittal, indicate corrections or revisions required, stamp with an action stamp, and return it.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.
2. Architect will not review submittals received from sources other than the Contractor.
3. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
4. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
5. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

B. Architect's Action: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows:

1. Reviewed: Final unrestricted release, work may proceed, provided it complies with the Contract Documents.
2. Furnish as Corrected: Final but restricted release, work may proceed, provided written confirmation is delivered to Architect by Contractor that installed work complied with notations and corrections on submittal and with Contract Documents.
3. Revise and Resubmit: Returned for resubmittal, do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain an acceptable action marking. Do not allow submittals with this marking (or unmarked submittals where a marking is required) to be used in connection with performance of the Work.
4. Rejected: Submittal content varies from the Contract Documents and is not acceptable for use on the Project, do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain an acceptable action marking. Do not allow submittals with this marking (or unmarked submittals where a marking is required) to be used in connection with performance of the Work.

1.9 COST FOR MULTIPLE RESUBMITTALS

A. Contractor's initial submittal and one resubmittal are included in the Architect's Construction Administration services to the Owner. Architect's services for review of subsequent resubmittals will be charged to the Owner at the Architect's current billing rate, and the Owner will deduct the charges from the Contract Amount by a change order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 014000
QUALITY AND TESTING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control including but not limited to the following:

1. General quality requirements.
2. Reports and documents.
3. Contractor’s responsibilities in regard to testing and inspections.
4. Inspector of Record (IOR).
5. Testing Agency.
6. Governing agency testing and inspection requirements.

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 control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. City Permit Fees are the responsibility of the contractor.
5. Special inspection costs are the responsibility of the owner.

C. Related Requirements:

1. Divisions 02 through 33 Sections for specific test and inspection requirements.

D. DSA Testing and Inspection Requirements for School Construction: The following requirements are per the Division of the State Architect (DSA); requirements indicated below may be repeated elsewhere in this Section or in other Sections of the Project Manual, where conflicts occur, the most stringent condition shall apply.

1. Tests:

    a. The owner will select an independent testing laboratory, approved by DSA, to conduct the tests. Selection of the material required to be tests shall be by the laboratory or the Owner's representative and not by the Contractor.
    b. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must by terms of the Contract be tested, in order that the Owner may arrange for the testing of same at the source of supply.
    c. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required shall not be incorporated in the job.
    d. The Owner will pay testing laboratory costs for all tests and inspections, but may be reimbursed by the Contractor for such costs under the Contract documents.

2. Tests Reports: One copy of all test reports shall be forwarded to the Division of the State Architect by the testing agency. Such reports shall include all the tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of Title 24 and with the approved specifications. Test reports shall show the specified design strength. They shall also state defiantly whether or not the material or materials tested comply with requirements.
3. Verification of Test Reports: Each testing agency shall submit to the Division of the State Architect a verified report in duplicate covering all the tests which are required to be made by that agency during the progress of the project. Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time, and at the completion of the project, covering all tests.
4. Inspection by the Owner:

    a. The Owner and his representatives shall at all times have access for the purpose of inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.
    b. The Owner shall have the right to reject materials and workmanship which are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the Owner. If the Contractor does no correct such rejected work within a reasonable time, fixed by written notice, the Owner may correct same and charge expense to the Contractor.
    c. Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of the work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any respect due to the fault of the Contractor or his subcontractor, he shall defray all expenses

of such examinations and of satisfactory reconstruction. If however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

5. Inspector – Owner's:

   a. An Inspector employed by the Owner, and approved by DSA, in accordance with the requirements of the California Code of Regulations, Title 24 will be assigned to the work. His duties are specifically defined in Title 24, Part I, Sec. 4-342.
   b. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. He shall have free access to any 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 keep him fully informed respecting the progress and manner of the work and the character of materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this contract.

6. Inspector – Owner – Field Office: The Contractor shall provide for the use of the Owner's Inspector a temporary office to be located as directed by the Inspector and to be maintained until removal is authorized by the Owner. This office shall of substantial water proof construction with adequate natural light and ventilation by means of stock design windows. The door shall have a lock. A table satisfactory for the study of plans and two chairs shall be provided by the Contractor. The Contractor shall provide and pay for adequate electric lights, private local telephone service with a loud exterior bell, and adequate heat for this field office until the completion of the Contract.

1.3 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 Architect.

C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

D. 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 specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. 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. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of 5 previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: 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 conflicting requirements that are different, but apparently equal, to Architect 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 Architect for a decision before proceeding.

1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Reports shall be prepared by the person performing the testing and inspecting. 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 reinspecting.

B. Governing Agency Verified Reports: Complete and submit Verified Reports as required by the Division of the State Architect and the 2019 California Administrative Code, Section 4-336. Reports are required to be completed by Architect, Architect's consulting Engineers, Owner's Inspector of Record, Contractor, and Testing Agency.

1. Form:

a. DSA form DSA-6C for Contractor.
b. DSA form DSA-6PI for Project Inspector.
c. DSA form DSA-6A/E for Architect and Architect's consulting Engineers.

C. Manufacturer's Technical Representative's Field Reports: Provide written report documenting tests and inspections specified in other Sections. Reports shall be prepared by Manufacturer's technical representative performing the testing and inspecting. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

D. Factory-Authorized Service Representative's Reports: Provide written report documenting tests and inspections specified in other Sections. Reports shall be prepared by Factory-authorized service representative performing the testing and inspecting. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

E. Permits, Licenses, and Certificates: For Owner'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.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. 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.

C. 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.

D. 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.

E. Professional Engineer Qualifications: A professional engineer who is legally licensed to practice in the state where 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 the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. 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 E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

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.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

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, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a written report of each test, inspection, and similar quality-assurance service to Architect, 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.

1.7 INSPECTOR OF RECORD

A. General: Owner will employ an Inspector of Record (IOR) for continuous inspection of the Work. Inspector of Record shall be acceptable to Architect and approved by the Division of the State Architect.

1. Inspector of Record shall act under the direction of the Architect and shall be subject to supervision by a representative of the Division of the State Architect.

B. Qualifications for Inspector of Record: Qualifications for the Inspector of Record shall be as stated in the California Code of Regulations, Title 24, Part 1, 2019 California Administrative Code, Section 4-333.1. Inspector of Record shall be DSA certified under one of the following classes:

1. Class 1: May inspect any project.
2. Class 2: May inspect any project except a project containing one or more new large structures with a primary lateral load resisting system of steel, masonry, or concrete.
3. Class 3: May inspect projects containing alterations to approved buildings, site placement of relocatable buildings, and construction of minor structures.
4. Class 4: May inspect site placement of relocatable buildings and associated site work.

C. Duties of the Inspector of Record: Duties of the Inspector of Record shall be as stated in the California Code of Regulations, Title 24, Part 1, 2019 California Administrative Code, Sections 4-333(b) and 4-342, and include the following:

1. Provide continuous inspection of the work.
2. Maintain files and records of approved plans and specifications including addenda and change orders.
3. Prepare semi-monthly reports of the progress of the work and submit copies to the Architect and the Division of the State Architect.
4. Notify the Division of the State Architect at the following times:

    a. At the start of construction of the project or restart of construction if work has suspended for a period of 2 or more weeks.
    b. At least 48 hours in advance of the time when foundation trenches will be complete, ready for footing forms.
    c. At least 48 hours in advance of the first placement of foundation concrete and 24 hours in advance of any subsequent or significant concrete placement.
    d. When all work on the project has been suspended for a period of more than 2 weeks.

5. Prepare and maintain records of certain phases of construction including but not limited to the following:

    a. Concrete placing operations. Show date and time of placing concrete and the time and date of removal of forms in each portion of the structure.
    b. Welding operations. The record shall include identification marks of welders, lists of defective welds, and manner of correction of defects.

6. Notify the Contractor, in writing, of any deviations from the approved construction documents.
7. Prepare and submit IOR’s Verified Report as required by DSA.

1.8 TESTING AGENCY

A. General: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to conduct tests and inspections required by authorities having jurisdiction. Testing agency shall be acceptable to Architect and the Division of the State Architect. Requirements for tests and testing agency shall be as stated in the California Code of Regulations, Title 24, Part 1, 2019 California Administrative Code, Section 4-335.

1. Costs for testing agency services will be paid by the Owner.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be paid by the Owner and the amount will be deducted from the Contract Sum by Change Order.

B. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Perform testing as required by the Contract Documents.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Taking all test specimens.
4. Prepare written reports of tests and inspections, and submit reports of each test, inspection, and similar quality-control service to Architect, Division of the State Architect, and Contractor.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
7. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
8. Retesting and reinspecting corrected work.
9. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
10. Do not perform any duties of Contractor.

1.9 CONTRACTOR REQUIREMENTS

A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. 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.
2. 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 Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
7. 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:

a. Access to the Work.
b. Incidental labor and facilities necessary to facilitate tests and inspections.
c. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
d. Facilities for storage and field curing of test samples.
e. Preliminary design mix proposed for use for material mixes that require control by testing agency.
f. Security and protection for samples and for testing and inspecting equipment at Project site.

8. 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.

a. Schedule times for tests, inspections, obtaining samples, and similar activities.

B. 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 "Submittal Procedures."

C. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

1.10 TESTS AND INSPECTIONS

A. Structural Tests and Inspections shall be as specified in Division 02 through 33 Sections for specific materials and as required by form DSA-103 which lists tests and inspections required by DSA as applicable to Project conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: 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 Architect.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 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 or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

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.

END OF SECTION

SECTION 014200
REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract. Architect’s approval does not release the Contractor from the responsibility to fulfill Contract requirements.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and

effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.

24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.

66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
83. FM Approvals - FM Approvals LLC; www.fmglobal.com.
84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
86. FSA - Fluid Sealing Association; www.fluidsealing.com.
87. FSC - Forest Stewardship Council U.S.; www.fscus.org.
88. GA - Gypsum Association; www.gypsum.org.
89. GANA - Glass Association of North America; www.glasswebsite.com.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
95. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
96. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
97. IAS - International Accreditation Service; www.iasonline.org.
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; www.iccsafe.org.
101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
104. IEC - International Electrotechnical Commission; www.iec.ch.
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
107. IESNA - Illuminating Engineering Society of North America; (See IES).

108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
109. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
110. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
111. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
116. ISO - International Organization for Standardization; www.iso.org.
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; www.itu.int/home.
119. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; www.lightning.org.
122. MBMA - Metal Building Manufacturers Association; www.mbma.com.
123. MCA - Metal Construction Association; www.metalconstruction.org.
124. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
125. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
126. MHIA - Material Handling Industry of America; www.mhia.org.
127. MIA - Marble Institute of America; www.marble-institute.com.
128. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
129. MPI - Master Painters Institute; www.paintinfo.com.
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
131. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
132. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
133. NADCA - National Air Duct Cleaners Association; www.nadca.com.
134. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
135. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
136. NBI - New Buildings Institute; www.newbuildings.org.
137. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
138. NCMA - National Concrete Masonry Association; www.ncma.org.
139. NEBB - National Environmental Balancing Bureau; www.nebb.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
141. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
142. NEMA - National Electrical Manufacturers Association; www.nema.org.
143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
145. NFPA - National Fire Protection Association; www.nfpa.org.
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; www.nfrc.org.
148. NHLA - National Hardwood Lumber Association; www.nhla.com.
149. NLGA - National Lumber Grades Authority; www.nlga.org.
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).

151. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
152. NRCA - National Roofing Contractors Association; www.nrca.net.
153. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
154. NSF - NSF International; www.nsf.org.
155. NSPE - National Society of Professional Engineers; www.nspe.org.
156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
158. NWFA - National Wood Flooring Association; www.nwfa.org.
159. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
160. PDI - Plumbing & Drainage Institute; www.pdionline.org.
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
162. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
163. RFCI - Resilient Floor Covering Institute; www.rfci.com.
164. RIS - Redwood Inspection Service; www.redwoodinspection.com.
165. SAE - SAE International; www.sae.org.
166. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
167. SDI - Steel Deck Institute; www.sdi.org.
168. SDI - Steel Door Institute; www.steeldoor.org.
169. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; www.siaonline.org.
172. SJI - Steel Joist Institute; www.steeljoist.org.
173. SMA - Screen Manufacturers Association; www.smainfo.org.
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
175. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
176. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
177. SPIB - Southern Pine Inspection Bureau; www.spib.org.
178. SPRI - Single Ply Roofing Industry; www.spri.org.
179. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
180. SSINA - Specialty Steel Industry of North America; www.ssina.com.
181. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
182. STI - Steel Tank Institute; www.steeltank.com.
183. SWI - Steel Window Institute; www.steelwindows.com.
184. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
185. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
186. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
190. TMS - The Masonry Society; www.masonrysociety.org.
191. TPI - Truss Plate Institute; www.tpinst.org.
192. TPI - Turfgrass Producers International; www.turfgrasssod.org.
193. TRI - Tile Roofing Institute; www.tileroofing.org.

194. UL - Underwriters Laboratories Inc.; www.ul.com.
195. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
196. USAV - USA Volleyball; www.usavolleyball.org.
197. USGBC - U.S. Green Building Council; www.usgbc.org.
198. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
199. WASTEC - Waste Equipment Technology Association; www.wastec.org.
200. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
201. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
202. WDMA - Window & Door Manufacturers Association; www.wdma.com.
203. WI - Woodwork Institute; www.wicnet.org.
204. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
205. WWPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.

18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
2. Division 01 Section “Fire Safety During Construction” for fire safety requirements during construction.
3. Division 31 Sections applicable to site clearing, earthwork, and trenching for temporary erosion and sedimentation control.
4. Division 32 Section "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 USE CHARGES

A. General: Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to Owner, Architect, testing agencies, and authorities having jurisdiction.

B. Water Service from Existing System: Water from Owner's existing water system is available for use; provide connections and extensions of services as required for construction operations.

1. Provide temporary water meter and pay use charges for water used by all entities for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use; provide connections and extensions of services as required for construction operations.

1. Provide temporary electric power meter and pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 SUBMITTALS

A. Erosion and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Comply with submittal requirements of Division 31 through 33 Sections as applicable for temporary erosion and sedimentation control plans.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. California Code of Regulations, Title 24, California Code requirements as applicable to the project.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.
6. Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. 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.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Materials for temporary facilities shall be acceptable to Architect, Owner, and Authorities having Jurisdiction (AHJ), shall be appropriate for intended use, and shall comply with governing codes and regulations.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts. Provide concrete or galvanized-steel bases for supporting posts.

C. Fencing Windscreen: Polyester fabric scrim with grommets for attachment to chain link fence, size and color as acceptable to, or required by, authorities having jurisdiction.

D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

2.2 TEMPORARY FIELD OFFICE FACILITIES

A. Field Offices, General: Prefabricated or mobile units having weatherproof exteriors, lockable doors and windows, and with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Contractor's Field Office: Of sufficient size to accommodate needs of Contractor, Owner, Architect, construction personnel office activities, and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture necessary for use and storage of Project documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room or area of sufficient size to accommodate meetings of 10 individuals; furnish with conference table, chairs, and 4-foot square tack and marker boards.
3. Electrical power service, 120-VAC, with no fewer than one duplex receptacle on each wall.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 78 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.
6. Communication Service and Equipment: Equip field office with phone and internet services and equipment adequate for project conditions and for use by Contractor, Architect, and Owner to access Project electronic documents and maintain electronic communications.

    a. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
    b. Equip office with not less than the following:

1) Desktop computer with capabilities compatible with Architect's requirements. Provide external hard drive backup.
2) Printer/Copier/Scanner: Single or multiple units as needed to accommodate color printing, photocopying, and scanning.

C. Inspector of Record Field Office: Contractor shall provide temporary office facilities for the Owner's Inspector of Record (IOR). Temporary facilities shall be of sufficient size to accommodate the needs of the IOR and associated project records. IOR facilities shall be provided with its own lockable exterior access, if interconnected with Contractor's facilities, a lockable door, controlled from the IOR side, shall be provided between the spaces. Furnish and equip office as follows:

1. Plan/layout table, 30 by 72 inches minimum.
2. File cabinets having a total capacity of not less than eight (8) legal size file drawers.
3. Open shelving/book case, 48 inches minimum in total shelving width.
4. Desk and Chair.
5. Plan rack.
6. Internet service.
7. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 78 deg F.
8. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.3 TEMPORARY STORAGE FACILITIES

A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from buildings.

2.4 TEMPORARY SANITARY FACILITIES

A. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use by construction and related administrative personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. Temporary toilets shall be self-contained, single-occupant units of the chemical, aerated recirculation type; provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Use of Owner's sanitary facilities is not permitted.

1. Accessible Sanitary Facilities: Sanitary facilities serving support facilities such as offices, meeting rooms, plan rooms, and serving personnel not directly associated with the actual processes of construction shall be accessible for a person using a wheelchair and shall comply with CBC Section 11B-213 (Ref. CBC 11B-201.4).

2.5 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas 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 qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures."

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

3.2 INSTALLATION, GENERAL

A. Locate facilities at locations directed by the Owner where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITIES AND BUILDING HVAC

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to private or municipal system as indicated on Drawings and as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

1. Existing Water Service: Where connection to Owner's existing water service is available and allowed, clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Where temporary power service is required, install electric power service overhead unless otherwise indicated.
2. Where Owner's existing power service is available, connect temporary service to Owner's existing power source, as directed by Owner, maintain equipment in a condition acceptable to Owner.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service: Provide temporary telephone service of sufficient size, capacity, and power characteristics required for construction operations in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment for each field office.

1. Post a list of important telephone numbers at a conspicuous location, include the following:

    a. Police and fire departments.
    b. Ambulance service.
    c. Contractor's home office.
    d. Contractor's emergency after-hours telephone number.
    e. Architect's office.
    f. Engineers' offices.
    g. Owner's office.
    h. Principal subcontractors' field and home offices.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Locate storage containers, and other temporary construction and support facilities for easy access in the areas designated and approved by the Architect and Owner. Comply with the following:

1. Do not locate temporary offices, shops, and sheds within 30 feet of building lines.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Parking areas for construction personnel shall be at location(s) as directed by Owner.

D. Dewatering: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.

E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Project Address Sign: Provide temporary project address sign as required by Authority having Jurisdication.
3. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

    a. Provide temporary, directional signs for construction personnel and visitors.

4. Maintain and touchup signs so they are legible at all times.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations.

1. Comply with requirements of the following:

a. Authorities having jurisdiction.
b. Division 01 Section "Execution" for progress cleaning.
c. Division 01 Section "Construction Waste Management and Disposal."

2. 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. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

I. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements erosion and sedimentation-control Drawings, EPA Construction General Permit, or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree or plant- protection zones.
2. Inspect, repair, and maintain erosion and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

G. Security Enclosure Fence and Lockup: Before construction operations begin, furnish and install project enclosure fence in a manner that will prevent people and animals from easily entering the site except by entrance gates. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

A. General: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.

3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    c. Remove materials that cannot be completely restored to their manufactured moisture level within 48hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

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. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been 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 temporary

facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. 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 temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

SECTION 015116
FIRE SAFETY DURING CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for fire safety during construction and demolition.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for additional facilities, requirements, and procedures required during construction.

1.3 SUBMITTALS

A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

1.4 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Comply with applicable provisions of the following:

1. NFPA 241.
2. California Fire Code, 2019 Edition, Chapter 33 “Fire Safety During Construction and Demolition” and the 2019 Editions of the following California Codes as Referenced by the California Fire Code:

a. California Building Code (CBC).
b. California Mechanical Code (CMC).
c. California Plumbing Code (CPC).
d. California Electrical Code (CEC).

B. Temporary Heating Equipment (CFC 3303):

1. General: Temporary heating devices shall be listed and labeled in accordance with the California Mechanical Code. Installation, maintenance and use of temporary heating devices shall be in accordance with the terms of the listing.

2. LP-Gas heaters: Heating devices shall be temporary, self-contained, liquid-propane-gas heaters with individual space thermostatic control. Fuel supplies for liquefied petroleum gas fired heaters shall comply with the California Fire Code, Chapter 61 Liquefied Petroleum Gases, and the California Mechanical Code.
3. Refueling: Refueling operations for liquid fueled equipment or appliances shall be conducted in accordance with the California Fire Code, Section 5705. The equipment or appliance shall be allowed to cool prior to refueling.
4. Installation: Clearance to combustibles from temporary heating devices shall be maintained in accordance with the labeled equipment. When in operation, temporary heating devices shall be fixed in place and protected from damage, dislodgement or overturning in accordance with the manufacturer's instructions.
5. Supervision: The use of temporary heating devices shall be supervised and maintained only by competent personnel.
6. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

C. Precautions Against Fire (CFC 3304):

1. Smoking: Smoking shall not be allowed on the project site.
2. Combustible Debris, Rubbish and Waste:

    a. Combustible debris, rubbish and waste shall not be accumulated within buildings.
    b. Combustible debris, rubbish and waste material shall be removed from buildings at the end of each shift of work.
    c. Rubbish containers with a capacity exceeding 5.33 cubic feet (40 gallons) used for temporary storage of combustible debris, rubbish and waste materials, shall have tight fitting or self-closing lids. Such containers shall be constructed entirely of materials that are non-combustible or materials that meet a peak rate of heat release not exceeding 300 kW/m^2 when tested in accordance with ASTM E 1354 at an incident heat flux of 50 kW/m^2 in the horizontal orientation.
    d. Materials susceptible to spontaneous ignition, such as oily rags, shall be stored in a listed disposal container.

3. Burning: Burning of materials shall not be allowed on the project site.
4. Fire Watch: Where required by the fire code official, a fire watch shall be provided for building demolition and for building construction during working hours that is hazardous in nature, such as temporary heating or hot work.

    a. Trained personnel shall be provided to serve as an on-site fire watch. Fire watch personnel shall be provided with not less than one approved means for notification of the fire department, and the sole duty of such personnel shall be to perform constant patrols and watch for the occurrence of fire. The combination of fire watch duties and site security is acceptable. Fire watch personnel shall be trained in the use of portable fire extinguishers.
    b. The fire watch personnel shall keep a record of all time periods of duty, including a log entry each time the site was patrolled, and each time a structure under construction was entered and inspected. The records and log entries shall be made available for review by the fire code official upon request.

5. Cutting and Welding: Welding, cutting, open torches, and other hot work operations and equipment shall comply with California Fire Code, Chapter 35 “Welding and Other Hot Work.’
6. Temporary Wiring for Electrical Power: Temporary wiring for electrical power and lighting installations used in connection with the construction, alteration or demolition of buildings, structures, equipment or similar activities shall comply with the California Electrical Code.

D. Flammable and Combustible Liquids (CFC 3305):

1. Storage of Flammable and Combustible Liquids: Storage of flammable and combustible liquids shall be in accordance with the California Fire Code, Section 5704.
2. Class I and Class II Liquids: Storage, use, and handling of flammable and combustible liquids at construction sites shall be in accordance with the California Fire Code, Section 5706.2. Ventilation shall be provided for operations involving the application of materials containing flammable solvents.
3. Housekeeping: Flammable and combustible liquid storage areas shall be maintained clear of combustible vegetation and waste materials. Such storage areas shall not be used for the storage of combustible materials.
4. Precautions Against Fire: Sources of ignition and smoking shall be prohibited in flammable and combustible liquid storage areas. Signs shall be posted in accordance the California Fire Code, Section 310.
5. Handling at Point of Final Use: Class I and Class II liquids shall be kept in approved safety containers.
6. Leakage and Spills: Leaking vessels shall be immediately repaired or taken out of service and spills shall be cleaned up and disposed of properly.

E. Flammable Gases (CFC 3306):

1. Storage and Handling: Storage and handling of flammable gasses shall comply with the California Fire Code, Chapter 58 “Flammable Gases and Flammable Cryogenic Fluids.”
2. Cleaning with Flammable Gases: Flammable gases shall not be used to clean or remove debris from piping open to the atmosphere.

F. Explosive Materials (CFC 3307): Explosive materials shall not be allowed.

G. Owner’s Responsibility for Fire Protection (CFC 3308)

1. Program Development: The Contractor shall be responsible for the development, implementation and maintenance of a written plan establishing a fire prevention program at the project site applicable throughout all phases of the construction.
2. Program Superintendent: The Contractor shall a person to be the Fire Prevention Program Superintendent who shall be responsible for the fire prevention program and ensure that it is carried out through completion of the project. The fire prevention program superintendent shall have the authority to enforce the provisions of the California Fire Code, Chapter 33, and other provisions as necessary to secure the intent of the California Fire Code, Chapter 33. Where guard service is provided in accordance with NFPA 241, the superintendent shall be responsible for the guard service.

3. Prefire Plans: The fire prevention program superintendent shall develop and maintain an approved prefire plan in cooperation with the fire chief. The fire chief and the fire code official shall be notified of changes affecting the utilization of information contained in such prefire plans.
4. Training: Training of responsible personnel in the use of fire protection equipment shall be the responsibility of the fire prevention program superintendent. Records of training shall be kept and made a part of the written plan for the fire prevention program.
5. Fire Protection Devices: The fire prevention program superintendent shall determine that all fire protection equipment is maintained and serviced in accordance with the California Fire Code. The quantity and type of fire protection equipment shall be approved. Fire protection equipment shall be inspected in accordance with the fire prevention program.
6. Hot Work Operations: The fire prevention program superintendent shall be responsible for supervising the permit system for hot work operations in accordance with the California Fire Code, Chapter 35.
7. Impairment of Fire Protection Systems: Impairments to any fire protection system shall be in accordance with the California Fire Code, Section 901.

    a. Smoke detectors and smoke alarms located in an area where airborne construction dust is expected shall be covered to prevent exposure to dust or shall be temporarily removed. smoke detectors and alarms that were removed shall be replaced upon conclusion of dust producing work. Smoke detectors and smoke alarms that were covered shall be inspected and cleaned, as necessary, upon conclusion of dust producing work.

8. Temporary Covering of Fire Protection Devices: Temporary coverings placed on or over fire protection devices to protect them from damage during construction processes shall be immediately removed upon the completion of the construction processes in the room or area in which the devices are installed.

H. Fire Reporting (CFC 3309)

1. Emergency Telephone: Emergency telephone facilities with ready access shall be provided in an approved location at the construction site, or an approved equivalent means of communication shall be provided. The street address of the construction site and the emergency telephone number of the fire department shall be posted adjacent to the telephone. Alternatively, where an equivalent means of communication has been approved, the site address and fire department emergency telephone number shall be posted at the main entrance to the site, in guard shacks, and in the construction site office.

I. Access for Fire Fighting (CFC 3310):

1. Required Access: Approved vehicle access for firefighting shall be provided to all construction or demolition sites. Vehicle access shall be provided to within 100 feet of temporary or permanent fire department connections. Vehicle access shall be provided by either temporary or permanent roads capable of supporting vehicle loading under all weather conditions. Vehicle access shall be maintained until permanent fire apparatus access roads are available.

2. Key Boxes: Key boxes shall be provided as required by the California Fire Code, Chapter 5 “Fire Service Features.”

J. Means of Egress (CFC 3311):

1. Stairways Required: (Requirements not applicable to buildings less than 50 feet in height or less than four stories).
2. Means of Egress: Required means of egress and required accessible means of egress shall be maintained during construction and demolition, remodeling or alterations and additions to any building unless an approved temporary means of egress system is provided.

K. Water Supply for Fire Protection (CFC 3312):

1. Water Supply for Fire Protection: An approved water supply for fire protection, either temporary or permanent, shall be made available as soon as combustible material arrives on site.

L. Standpipes (CFC 3313):

1. Where Required: In buildings required to have standpipes by California Fire Code Section 905.3.1, not less than one standpipe shall be provided for use during construction. Such standpipes shall be installed prior to construction exceeding 40 feet in height above the lowest level of fire department vehicle access. Such standpipes shall be provided with fire department hose connections at locations adjacent to stairways complying with California Fire Code Section 3311.11. As construction progresses, such standpipes shall be extended to within one floor of the highest point of construction having secured decking or flooring.
2. Buildings Being Demolished: Where a building is being demolished and a standpipe is existing within such a building, such standpipe shall be maintained in an operable condition so as to be available for use by the fire department. Such standpipe shall be demolished with the building but shall not be demolished more than one floor below the floor being demolished.
3. Detailed Requirements: Standpipes shall be installed in accordance with the provisions of California Fire Code Section 905.

    a. Standpipes shall be either temporary or permanent in nature, and with or without a water supply, provided that such standpipes comply with the requirements of California Fire Code Section 905 as to capacity, outlets and materials.

M. Automatic Sprinkler System (CFC 3314):

1. Completion Before Occupancy: In buildings where an automatic sprinkler system is required by the California Fire Code or California Building Code, it shall be unlawful to occupy any portion of a building or structure until the automatic sprinkler system installation has been tested and approved, except as provided in California Fire Code Section 105.3.4.

2. Operation of Valves: In buildings where an automatic sprinkler system is provided, operation of sprinkler control valves shall be allowed only by properly authorized personnel and shall be accompanied by notification of duly designated parties. Where the sprinkler protection is being regularly turned off and on to facilitate connection of newly completed segments, the sprinkler control valves shall be checked at the end of each work period to ascertain that protection is in service.

N. Portable Fire Extinguishers (CFC 3315):

1. Portable Fire Extinguishers: Structures under construction, alteration or demolition shall be provided with not less than one approved portable fire extinguisher in accordance with the California Fire Code, Section 906 and sized for not less than ordinary hazard, as follows:

   a. At each stairway on all floor levels where combustible materials have accumulated.
   b. In every storage and construction shed.
   c. Additional portable fire extinguishers shall be provided where special hazards exist including, but not limited to, the storage and use of flammable and combustible liquids.

O. Motorized Construction Equipment (CFC 3316):

1. Conditions of Use: Internal combustion powered construction equipment shall be used in accordance with all of the following conditions:

   a. Equipment shall be located so that exhausts do not discharge against combustible material.
   b. Exhausts shall be piped to the outside of the building.
   c. Equipment shall not be refueled while in operation.
   d. Fuel for equipment shall be stored in approved areas outside of the building.

P. Safeguarding Roofing Operations (CFC 3317):

1. General: Roofing operations utilizing heat producing systems or other ignition sources shall be conducted in accordance with California Fire Code Sections 3317.2 and 3317.3, and Chapter 35.
2. Asphalt and Tar Kettles: Asphalt and tar kettles shall be operated in accordance with the California Fire Code, Section 303.
3. Fire Extinguishers for Roofing Operations: Fire extinguishers shall comply with the California Fire Code, Section 906. There shall be not less than one multi-purpose portable fire extinguisher with a minimum 3-A 40-B:C rating on the roof being covered or repaired.

PART 2 - PRODUCTS

2.1 TEMPORARY EQUIPMENT, GENERAL

A. Temporary Equipment: Temporary equipment shall comply with requirements of Division 01 Section “Temporary Facilities and Controls,” and shall comply with the requirements of this Section.

PART 3 - EXECUTION

A. Fire Safety Observation, Procedures, and Features: Provide fire safety observation activities, procedures, and features as required and in compliance with regulatory requirements.

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. 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; and comparable products.

B. Related Requirements:

1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

A. Products: Items obtained 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, which is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Products: Products of a listed manufacturer that are demonstrated to meet or exceed the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified ‘Basis of Design’ 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-design," 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.

1.4 SUBMITTALS

A. Product Submittals: Comply with requirements in Division 01 Section "Submittal Procedures" and submittal requirements of Division 02 through 33 Sections to show compliance with product requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. 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 determine compliance with the Contract Documents and to determine 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. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 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: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for 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. See Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Warranty Submittals: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, 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. Owner 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," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Restricted List: Where Specifications include the phrase “provide one of the following” or similar phrase and lists 2 or more manufacturers and/or products, provide one of the products indicated. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed manufacturer or product.
2. Non-restricted List: Where Specifications include the phrase “includes, but are not limited to the following” or similar phrase, provide one of the products indicated or an unnamed product that complies with requirements indicated.
3. Basis of Design: Where Specifications include the phrase “Basis of Design” and lists a named manufacturer and product, provide the product indicated.

    a. Where a “Comparable” product of listed manufacturers is indicated following a “Basis of Design” manufacturer/product, a comparable product of one of the listed manufacturers may be provided in lieu of the basis of design manufacturer/product subject to compliance with product requirements and the following:

        1) Evidence that the proposed product:

            a) Does not require revisions to the Contract Documents.
            b) Is consistent with the Contract Documents and will produce the indicated results.
            c) Is compatible with other portions of the Work.

        2) Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
        3) Evidence that proposed product provides specified warranty.

    b. Where no “Comparable” manufacturers/products are indicated following a “Basis of Design” manufacturer/product, comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed manufacturer or product.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect'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 Division 01 Section "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION

3.1 PRODUCT INSTALLATION

A. General: Install products in accordance with Drawings, Specifications, and product manufacturer's written installation instructions. Installation shall include examination of conditions and preparations necessary for proper installation.

END OF SECTION

SECTION 017300
EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. 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. Installation of the Work.
4. Cutting, patching and repairing.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Requirements:

1. Division 01 Section "Summary of Work" for limits on use of Project site.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 02 Section "Selective Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

A. Accessible Route: A continuous unobstructed path connecting accessible elements and spaces of an accessible site, building or facility that can be negotiated by a person with a disability using wheelchair, and that is also safe for and usable by persons with other disabilities. Interior accessible routes may include corridors, hallways, floors, ramps, elevators and lifts. Exterior accessible routes may include accessible parking stalls and access aisles, curb ramps, crosswalks at vehicular ways, walks, ramps and lifts.

B. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

C. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 SUBMITTALS

A. Surveys: Submit survey of accessible route improvements stamped and signed by land surveyor or professional engineer certifying that elevations and slopes of improvements comply with disabled access requirements.

1. Survey shall be a separate submittal and shall also be included in the Project Record Documents.

1.5 QUALITY ASSURANCE

A. Surveyor Qualifications: A professional engineer or 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.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting of structural elements must be performed, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

a. Primary operational systems and equipment.
b. Fire separation assemblies.
c. Air or smoke barriers.
d. Fire-suppression systems.
e. Mechanical systems piping and ducts.
f. Control systems.
g. Communication systems.
h. Fire-detection and alarm systems.
i. Conveying systems.
j. Electrical wiring systems.
k. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Sprayed fire-resistive material.

d. Equipment supports.
e. Piping, ductwork, vessels, and equipment.

4. Visual Elements: Cut and patch construction in a manner that results in no visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in Division 02 trough 33 Sections.

B. In-Place Materials: Use materials for patching 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, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, 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, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner 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 caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Request for Information."

3.3 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 Architect 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 limits on use of Project site.

3. Establish dimensions within tolerances indicated. 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 Architect 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 rim 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 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 Architect.

3.4 FIELD ENGINEERING

A. 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 Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
3. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
4. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

B. Survey of Accessible Routes: On completion of site improvements, prepare a topographic survey of accessible routes showing dimensions, locations, and elevations of accessible features in order to certify compliance with requirements for disabled access. Survey shall be limited to site features included in the Work of the Project.

C. Certified Survey: On completion of site drainage features, foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 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 96 inches in occupied spaces and 90 inches in unoccupied spaces.

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. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
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.

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.

3.6 CUTTING, PATCHING, AND REPAIRING

A. Cutting, Patching and Repairing, General: Employ skilled workers to perform cutting, patching, and/or repairing. Proceed with cutting, patching, and repairing 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. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. 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.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

F. 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. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching and Repairing: Patch and repair construction by grinding, filling, leveling, refinishing, closing up, and similar operations following performance of other work.

Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched and repaired areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
    b. Where finishes have been removed, patch and repair substrates to receive new finishes; substrates shall be prepared to comply with requirements of manufacturer of final finish material.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. 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 waste materials more than seven days during normal weather or three 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.

a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

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 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: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "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.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 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.

END OF SECTION

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Recycling nonhazardous construction and demolition waste.
2. Disposing of nonhazardous construction and demolition waste.

B. Related Requirements:
1. Division 02 Section "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
2. Division 04 Sections as applicable to masonry for disposal requirements for masonry waste.
3. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit Waste Management Plan within 30 days of date established for the Notice to Proceed indicating method of compliance with the California Green Building Standards Code.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use separate forms for construction waste and demolition waste. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste 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. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. 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.

F. 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.

G. Qualification Data: For waste management coordinator and refrigerant recovery technician.

H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and

that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employee assigned by the General Contractor, with a record of successful waste management coordination of projects with similar requirements. Individual of firm, or Contractor's employee, shall be a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." 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.
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.

1.8 WASTE MANAGEMENT PLAN/REGULATORY REQUIREMENTS

A. Construction Waste Management, General: Recycle and/or salvage for reuse a minimum of 65 percent of the non-hazardous construction and demolition waste in accordance with one of the following 2019 California Green Standards Code (GBSC) Sections, or meet a local construction and demolition waste management ordinance, whichever is more stringent:

1. Construction Waste Management Plan (GBSC Section 5.408.1.1): Where a local jurisdiction does not have a construction and demolition waste management ordinance that is more stringent, provide Waste Management Plan that:

    a. Identifies the construction and demolition waste materials to be diverted from disposal by efficient usage, recycling, reuse on the project or salvage for future use or sale.
    b. Determines if construction and demolition waste materials will be sorted on-site (source separated) or bulk mixed (single stream).

c. Identifies diversion facilities where construction and demolition waste material collected will be taken.
d. Specifies the amount of construction and demolition waste materials diverted shall be calculated by weight or volume, but not by both.

2. Waste Management Company (GBSC Section 5.408.1.2): 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 CGBSC Section 5.408.1.

a. Exception 1: Excavated soil and land-clearing debris.
b. Exception 2: Alternate waste reduction methods developed by working with local agencies if diversion or recycle facilities capable of compliance with this item do not exist.
c. Demolition waste meeting local ordinance or calculated in consideration of local recycling facilities and markets.

3. Waste Stream Reduction Alternative (GBSC Section 5.408.1.3): The combined weight of new construction disposal that does not exceed two pounds per square foot of building area may be deemed to meet the 65 percent minimum requirement as approved by the enforcing agency.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management procedures. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management procedures during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Division 01 Section "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management procedures to everyone concerned within three days of submittal return.

2. Distribute waste management procedures to entities when they first begin work on-site. Review procedures and locations established for salvage, recycling, and disposal.

D. 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.

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 Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Receivers and Processors: Refer to local county websites for the county in which the Project is located for listings of available recycling receivers and processors, and materials accepted.

C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

D. 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.

E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. 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. Metal Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

G. Metal Conduit: Reduce conduit to straight lengths and store by type and size.

3.4 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. Wood Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For 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. Wood Materials:

1. Clean Cut-Offs of 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 Division 32 Sections as applicable to planting for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 017700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Closeout procedures at completion.
2. Final cleaning.
3. Repair of the Work.

B. Related Requirements:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance documentation requirements.
2. Division 01 Section "Project Record Drawings" for preparing and submitting Project Record Drawings.
3. Division 01 Section "Warranties" for submitting final warranty information.
4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
5. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 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: Submit 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 Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

2. Submit closeout documentation specified in other Division 01 Sections, including project record drawings, operation and maintenance data, construction photographic documentation, warranties, and similar final record information.
3. Submit closeout documentation specified in individual Division 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance materials specified in individual Division 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
5. Submit test/adjust/balance records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner'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 Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
6. Advise Owner of changeover in 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 for Completion a minimum of 10 days prior to date the work will be completed and ready for inspection. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected.

1. Architect’s Punch List: During inspection, Architect will prepare a list of items needing completion or correction (punch list), a copy of the punch list will be distributed to the Contractor and Owner.
2. Reinspection: Request reinspection when the Work identified in previous inspection as incomplete is completed or corrected.
3. Results of completed inspection will form the basis of requirements for final completion.

E. Contractor's Cost for Reinspection: Architect will perform one inspection and one reinspection at no additional cost to the Contractor. The expense for the Architect's time for additional inspections will be paid by the Owner with the amount being deducted from the Contract Sum. The expense will be based on an hourly rate in accordance with the Architect's standard hourly rate schedule in effect at the time the work is performed with a minimum of $400.00 dollars for each additional reinspection.

1.4 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.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
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 Architect (Company name).
    d. Name of Contractor (Company Name).
    e. Page number.

4. Submit list of incomplete items in one of the following formats:

    a. MS Excel electronic file. Architect will return annotated file.
    b. PDF electronic file. Architect will return annotated file.

PART 2 - PRODUCTS

2.1 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.

1. Use cleaning products that comply with the California Green Building Standards Code maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 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 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.
k. Wipe surfaces of mechanical, electrical, 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 light fixtures, lamps, globes, and reflectors to function with full efficiency.
p. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

1. Comply with requirements of Division 02 through 33 Sections as applicable to the Work to be restored and/or repaired.

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 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.
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

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance documentation, including the following:

1. Operation and maintenance documentation directory.
2. Operation and maintenance data for equipment and systems.
3. Product maintenance data.

B. Related Sections:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Demonstration and Training" for demonstration and training materials.
3. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 SUBMITTALS

A. Content: Operations and maintenance documentation content is specified in individual Specification Sections and is to be reviewed at the time of Section submittals. Submit reviewed documentation formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed content to correspond to revisions and field conditions.

B. Format: Submit documentation in the following format:

1. PDF electronic file. Assemble documentation into a composite electronically indexed file; submit two (2) copies on compact disc (CD) media for each submittal.

   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked directory to data documents.
   b. Enable inserted reviewer comments on initial submittals.
   c. Label CD's and case/cover as follows:

      1) First Line: CLOSE-OUT DOCUMENTS.
      2) Project name and date.
      3) Architect company name.
      4) Division of State Architect application number.
      5) Building permit reference.
      6) Contractor company name.

2. Initial Submittal: Submit initial submittal at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content is acceptable.

3. Final Submittal: Submit in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training.

   a. Correct or modify each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION, GENERAL

A. Electronic Files: Develop documentation in the form of a multiple file composite electronic PDF file stored on a compact disc (CD) for each data type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.2 OPERATION AND MAINTENANCE DATA DIRECTORY

A. Directory: Prepare a single, comprehensive directory of operation and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. List of Products.
5. Table of contents.

B. List of Systems: 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 operation and maintenance documentation section.

E. Identification: In the documentation directory and in each section, identify each piece of equipment with same designation used in the Contract Documents. If no designation exists, assign an appropriate designation.

2.3 REQUIREMENTS FOR OPERATION AND MAINTENANCE DATA

A. Organization: Unless otherwise indicated, organize data into a separate section for each system and a separate section for each piece of equipment not part of a system. Documentation shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Data contents.

B. Title Page: Include the following information as applicable:

1. Subject matter.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Architect company name.
6. Contractor company name.
7. Installer company name.
8. Cross-reference to related systems in other operation and maintenance documentation.

C. Table of Contents: List each item (Product, equipment or system) included in documentation, identify by name and/or equipment reference, and cross-reference to Specification Section number in Project Manual.

D. Data Content: Arrange content alphabetically by designation. If possible, assemble instructions for subsystems, equipment, and components of one system into a single section.

2.4 OPERATION DOCUMENTATION

A. Content: In addition to requirements in this Section, include operation documentation required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
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.
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. Use designations for products indicated on Contract Documents.
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.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE DOCUMENTATION

A. Content: For each system and piece of equipment, 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 and piece of equipment included in documentation, identify by product name and arrange to match table of contents. For each piece of equipment, 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 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.
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 video recording, 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.

2.6 PRODUCT MAINTENANCE DATA

A. Content: Organize data 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 data identified by product name and arranged to match 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.
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.

PART 3 - EXECUTION

3.1 DOCUMENTATION PREPARATION

A. Directory: Prepare a directory that provides an organized reference to operation and maintenance documentation.

B. Product Maintenance Documentation: Assemble a complete set of product maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Documentation: 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.

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.

D. Manufacturers' Data: Where documentation contains 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.

E. 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 documentation.
2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."

F. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 017836
WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

B. Related Sections include but are not limited to the following:

1. Division 01 Section "Closeout Procedures."
2. Division 01 Section "Operation and Maintenance Data."
3. Division 02 through 33 Sections for specific warranty requirements.

1.3 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special project warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

B. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

C. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

E. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

F. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect 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 Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranties: Submit (2) copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. 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.
2. Include copy of each warranty in operation and maintenance documentation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 017839
PROJECT RECORD DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record drawings.

B. elated Sections:

1. Division 01 Section "Execution" for surveys of exterior accessible routes.
2. Division 01 Section "Closeout Procedures" for general closeout procedures.
3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Submit Record Drawings as follows:

1. Initial Submittal: Submit an original paper copy set of marked-up “Record Drawings.”

a. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

2. Final Submittal: Submit the following:

a. Original paper copy set of marked-up “Record Drawings.”
b. Record Digital Data Files: PDF electronic digital data files of scanned original Record Drawings, scan all drawings whether or not changes and additional information were recorded; save electronic files to compact disc (CD) format; submit two (2) copies.
c. Print Set of Record Drawings: Print set of Record digital data files; print each drawing whether or not changes and additional information were recorded; print in color. Submit one set.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued. Record Print sets shall include all drawings of the construction documents including original project Drawings, Shop Drawings, Supplemental Drawings, Coordination Drawings, Clarification Drawings, Change Orders, and similar drawings. Record Print sets shall include all drawings of contract documents whether or not changes and additional information were recorded.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up Record Prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an understandable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding archive photographic documentation.

2. 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.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect'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.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive 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 Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file with comment function enabled.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect 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 Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. 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. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect (Company name).
    e. Name of Contractor (Company name).

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of Record Drawings during the construction period for Project Record Drawing purposes. Post changes and modifications to Project Record Drawings as they occur; do not wait until the end of Project.

B. Maintenance of Record Drawings: Store Record Drawings in the field office apart from the Contract Documents used for construction. Do not use Project Record Drawings for construction purposes. Maintain Record Drawings in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Drawings for Architect's reference during normal working hours.

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel in demonstration and training of operation and maintenance of systems, subsystems, and equipment.

B. Related Sections:

1. Division 01 Section “Operation and Maintenance Data” for operation and maintenance manuals and data.
2. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

A. Training materials in addition to Operation and Maintenance manuals required in Division 01 Section “Operation and Maintenance Data.”

B. Instruction Program Schedule: Submit outline schedule of instructional program that includes and coordinates programs for all products, equipment, and systems requiring demonstration and training. Schedule shall include a list of training sessions, proposed dates, times, length of instruction time.

1. Schedule shall be coordinated and finalized with the Owner.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training of Owner’s personnel.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner, adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training sessions with content of approved operation and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Provide instruction programs that include training sessions for each system and for equipment not part of a system, as required by individual Specification Sections. Include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Operating standards.
    c. Regulatory requirements.
    d. Equipment function.
    e. Operating characteristics.
    f. Limiting conditions.
    g. Performance curves.

2. 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.

3. 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.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    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.

5. Adjustments: Include the following:

    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

7. 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.

8. 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

3.1 PREPARATION

A. Assemble educational materials necessary for instruction and training. Assemble training manuals organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

B. Coordinate with Owner for number of instruction times, location, and number of participants.

C. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule initial training with Owner**,** through Architect with at least 7 days' advance notice.

C. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

SECTION 018113
SUSTAINABLE DESIGN REQUIREMENTS, DSA CALGREEN

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with the 2022 California Green Building Standards Code (CGBSC) for Division of the State Architect (DSA) requirements.

B. Related Sections:

1. Project Manual Appendix No. 2, DSA Project Submittal Guideline GL-4.

1.3 SUBMITTALS

A. Submit Sustainable Design Requirement submittals as required by Division 02 through 33 Specification Sections. Submittals may include, but are not limited to, the following:

1. Construction Waste Management Plan and other submittals as required by Division 01 Section "Construction Waste Management and Disposal."
2. Air Quality: Product data for filtration media.
3. Product data for adhesives, sealants, and coatings indicating VOC content of each product used.
4. Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.4 REGULATORY REQUIREMENTS

A. DSA's "Project Submittal Guideline: CalGreen Code," form GL-4 (http://www.documents.dgs.ca.gov/dsa/pubs/GL_4.pdf). Contractor's responsibility with regard to sustainable design requirements shall include, but not be limited, to the following requirements of the 2019 California Green Building Standards Code).

B. Outdoor Lighting: Outdoor lighting shall be designed and installed to comply with requirements of the 2019 CGBSC, Section 5.106.8.

C. Energy Efficiency: Comply with requirements of the California Energy Code and as indicated on the Drawings.

D. Plumbing Fixtures: Plumbing Fixtures shall comply with requirements of the 2019 CGBSC, Section 5.303.3.

E. Moisture Control: Irrigation systems shall be designed and installed to prevent spray on buildings; per requirements of the 2019 CGBSC, Section 5.407.2.1.

F. Construction Waste Management: Comply with requirements of the 2019 CGBSC, Section 5.408.1 and Division 01 Section "Construction Waste Management and Disposal." Construction Waste Management shall include, but not be limited to, the following:

1. Construction Waste Management Plan.
2. Recycling, reuse, and/or salvaging non-hazardous construction waste.

G. Environmental Quality/Pollutant Control: Comply with requirements of the 2019 CGBSC, Sections as follows:

1. Section 5.504.3, Covering of Duct Openings and Protection of Mechanical equipment. At the time of rough installation and during storage on the construction site until final startup of the heating, cooling and ventilating equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal or other methods acceptable to the enforcing agency to reduce the amount of dust, water and debris which may enter the system.
2. Section 5.504.4.1, Adhesives and Sealants: Adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

    a. Adhesives: 2019 CGBSC Table 5.504.4.1 Adhesive VOC Limit:

        1) Indoor Carpet Adhesives: 50 g/L.
        2) Carpet Pad Adhesives: 50 g/L.
        3) Rubber Floor Adhesives: 60 g/L.
        4) Wood Flooring Adhesive: 100 g/L.
        5) Subfloor Adhesives: 50 g/L.
        6) Ceramic Tile Adhesives: 65 g/L.
        7) VCT and Asphalt Tile Adhesives: 50 g/L.
        8) Gypsum Board and Panel Adhesives: 50 g/L.
        9) Cove Base Adhesives: 50 g/L.
        10) Multipurpose Construction Adhesives: 70 g/L.
        11) Structural Glazing Adhesives: 100 g/L.
        12) Single-Ply Roof Membrane Adhesive: 250 g/L.
        13) Other Adhesives not specifically listed: 50 g/L.
        14) PVC Welding Compounds: 510 g/L.
        15) CPVC Welding Compounds: 490 g/L.
        16) ABS Welding Compounds: 325 g/L.
        17) Plastic Cement Welding Compounds: 250 g/L.
        18) Adhesive Primer for Plastic: 550 g/L.
        19) Contact Adhesive: 80 g/L.

20) Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine-covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
21) Structural Wood Member Adhesive: 140 g/L.
22) Top and Trim Adhesive: 250 g/L.
23) Metal-to-Metal Adhesives: 30 g/L.
24) Plastic Foam Adhesives: 50 g/L.
25) Adhesives for Porous Materials (Except Wood): 50 g/L.
26) Wood Glues: 30 g/L.
27) Fiberglass Adhesives: 80 g/L.

b. Sealants: 2019 CGBSC Table 5.504.4.2, Sealant VOC Limit:

1) Architectural Sealants: 250 g/L.
2) Nonmembrane Roof Sealants: 300 g/L.
3) Paving Sealants: 250 g/L.
4) Single-Ply Roof Membrane Sealants: 450 g/L.
5) Other Sealants: 420 g/L.
6) Sealant Primers for Nonporous Substrates: 250 g/L.
7) Sealant Primers for Porous Substrates: 775 g/L.
8) Modified Bituminous Sealant Primers: 500 g/L.
9) Other Sealant Primers: 750 g/L.

3. Section 5.504.4.3, Paints and Coatings: Architectural Coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Paints and Coatings: 2019 CGBSC Table 5.504.4.3, VOC Content Limits for Architectural Coatings:

1) Flat Paints and Coatings: VOC not more than 50 g/L.
2) Nonflat Paints and Coatings: VOC not more than 100 g/L.
3) Nonflat High-Gloss Paints and Coatings: VOC not more than 150 g/L.
4) Dry-Fog Coatings: VOC not more than 150 g/L.
5) Floor Coatings: VOC not more than 100 g/L.
6) Pretreatment Wash Primers: VOC not more than 420 g/L.
7) Primers, Sealers, and Undercoaters: VOC not more than 100 g/L.
8) Rust Preventative Coatings Applied to Ferrous Metals: VOC not more than 250 g/L.
9) Shellacs, Clear: VOC not more than 730 g/L.
10) Shellacs, Pigmented: VOC not more than 550 g/L.
11) Stains: VOC not more than 250 g/L.
12) Clear Wood Finishes, Varnishes: VOC not more than 275 g/L.
13) Clear Wood Finishes, Lacquers: VOC not more than 275 g/L.
14) Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.

4. Section 5.504.4.3.1, Aerosol Paints and Coatings: 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 California

Code of Regulations, Title 17, commencing with Section 94520; and in areas under the jurisdiction of the Bay Area Air Quality Management District additionally comply with the percent VOC by weight of product limits of Regulation 8 Rule 49. Comply with requirements of 2019 CGBSC, Table 5.504.4.3.

H. Carpet Systems: Comply with requirements of CGBSC, Section 5.504.4.4.

1. All carpet installed in the building interior shall meet at least one of the following testing and product requirements:

   a. Carpet and Rug Institute's Green Label Plus Program.
   b. Compliant with the VOC-emission limits and testing requirements specified in the California Department of Public Health Standard Method for the Testing and Evaluation Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version1.1, February 2010 (also known as CDPH Standard Method V1.1. or Specification 01350)
   c. NSF/ANSI 140 at the Gold level or higher.
   d. Scientific Certifications Systems Sustainable Choice.
   e. Compliant with the California Collaborative for High Performance Schools (2014 CA-CHPS) Criteria and listed in the CHPS High Performance Product Database.

2. Carpet Adhesive: VOC content not exceeding 50 g/L per CGBSC Table 5.504.4.1 when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

I. Composite Wood Products: Comply with requirements of CGBSC Section 5.504.4.5; hardwood plywood, particleboard, and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure (ATCM) for Composite Wood (17 CCR 93120 et seq.) Those materials not exempted by the ATCM must meet the specified emission limits, as shown in CGBSC Table 5.504.4.5.

J. Resilient Flooring Systems: Comply with requirements CGBSC, Section 5.504.4.6.

1. Resilient Flooring: For 80% 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 2010 Standard Method for the Testing and Evaluation Chambers, Version 1.1, February 2010.
   c. Compliant with the California Collaborative for High Performance Schools (2014 CA-CHPS) Criteria and listed in the CHPS High Performance Product Database.
   d. Products certified under UL Greenguard Gold (Formerly the Greenguard Children's and Schools Program).

2. Resilient Floor Adhesive: VOC content not exceeding 50 g/L per CGBSC Table 5.504.4.1 when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

K. HVAC Filters: Comply with requirements CGBSC, Section 5.504.5.3; in mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a Minimum Efficiency Reporting Value (MERV) of 13. MERV 13 filters shall be installed prior to occupancy and recommendations for maintenance with filters of the same value shall be included in the operation and maintenance manual.

1. Exception: Existing mechanical equipment.
2. Labeling: Installed filters shall be clearly labeled by the manufacturer indicating the MERV rating.

L. Outside Air Delivery: Comply with requirements CGBSC, Section 5.506.1; for mechanically or naturally ventilated spaces in buildings, meet the minimum requirements of Section 120.1 (Requirements For Ventilation) of the 2019 California Energy Code, or the applicable local code, whichever is more stringent, and Division 1, Chapter 4 of CCR, Title 8.

M. Acoustical Control: Comply with requirements CGBSC, Section 5.507.4, employ building assemblies and components with Sound Transmission Class (STC) values determined in accordance with ASTM E 90 and ASTM E 413 or Outdoor–Indoor Sound Transmission Class (OITC) determined in accordance with ASTM E 1332, using either the prescriptive or performance method in CGBSC Section 5.507.4.1 or 5.507.4.2.

1. Exception:

    a. Buildings with few or no occupants or where occupants are not likely to be affected by exterior noise, as determined by the enforcement authority, such as factories, stadiums, storage, enclosed parking structures and utility buildings.
    b. Exception: For public schools and community colleges, the requirements of CGBSC Section 5.507.4, and all subsections, apply only to new construction.

N. Interior Sound Transmission: Comply with requirements CGBSC, Section 5.507.4.3; wall and floor-ceiling assemblies separating tenant spaces and tenant spaces and public places shall have an STC of at least 40.

O. Ozone Depletion and Greenhouse Gas Reductions: Comply with requirements CGBSC, Section 5.508.1; installation of HVAC, refrigeration, and fire suppression equipment shall comply with CGBSC Sections 5.508.1.1 and 5.508.1.2.

1. Chlorofluorocarbons (CFCs): Install HVAC, refrigeration and fire suppression equipment that do not contain CFCs.
2. Halons: Install HVAC, refrigeration and fire suppression equipment that do not contain Halons.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SECTION 019113
GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Owner's Project Requirements (OPR) and Basis of Design (BoD) documentation are included by reference for information only.

1.2 SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

B. Related Sections:

1. Division 23 Section "Commissioning of HVAC Systems" for commissioning process activities for HVAC systems, assemblies, equipment, and components.

1.3 DEFINITIONS

A. BoD: Basis of Design. A document 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.

B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority.

D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and each Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 EACH CONTRACTOR'S RESPONSIBILITIES

A. Each Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings held on a regularly scheduled basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review and accept construction checklists provided by the CxA.
6. Complete paper and/or electronic construction checklists as Work is completed and provide to the Commissioning Authority on a predetermined daily or weekly basis.
7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
8. Complete commissioning process test procedures.

1.7 CxA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Provide commissioning plan.

C. Convene commissioning team meetings.

D. Provide Project-specific construction checklists and commissioning process test procedures.

E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.

F. Prepare and maintain the Issues Log.

G. Prepare and maintain completed construction checklist log.

H. Witness systems, assemblies, equipment, and component startup.

I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 023000
SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes information for the Geotechnical Investigation Report prepared for this Project.

B. Related Sections:

1. Division 31 Sections as applicable to site clearing, earthwork, excavations, fill, trenching, and paving.

1.3 GEOTECHNICAL REPORT

A. A Geotechnical report for this project has been prepared by:

Soils Engineering, Inc.
4400 Yeager Way
Bakersfield, CA 93313
Phone: (661) 831-5100

Report 20-17640; June 25, 2020

B. A copy of the Geotechnical Investigation Report is contained in the Appendix of this Project Manual.

C. The Geotechnical Investigation Report shall be considered to be a part of the Contract Documents. The Contractor shall become familiar and comply with the requirements and recommendations in the Report.

D. The Geotechnical Investigation Report identifies subsurface soil and ground water conditions and offers recommendations for earthwork and preparation of subsurface conditions for the Work of this Project.

E. The Geotechnical Investigation Report is not a warranty of subsurface conditions. Should subsurface conditions be found to vary substantially from the Report, changes in design and construction of foundations may be made by the Architect, with resulting credits or expenditures to the Contract sum accruing to the Owner.

1.4 QUALITY ASSURANCE

A. A soil engineer will be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling, and grading, and to perform compaction tests.

1. Requirements for Field Quality Control are included in individual Sections as applicable to excavating, trenching, filling, backfilling, and grading.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 024119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected site elements.
2. Salvage of existing items to be reused, recycled, or returned to Owner.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
2. Division 01 Section "Photographic Documentation" for photographic documentation of pre-demolition conditions.
3. Division 01 Section "Execution" for cutting and patching procedures.
4. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of nonhazardous demolition and construction waste.
5. Division 31 Section “Site Clearing” for removing above and below-grade site improvements not part of selective demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be salvaged or reinstalled.

B. Remove and Salvage to Owner: Detach item from existing construction in a manner to prevent damage and deliver to Owner ready for reuse.

C. Remove and Salvage for Reinstallation: Detach item from existing construction in a manner to prevent damage, prepare for reuse, and securely store item until it is to be reinstalled at locations indicated.

D. Existing to Remain: Existing items or improvements that are to remain and not be removed. Existing items to remain shall be protected from damage during the course of construction.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for physical damage, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.

C. Inventory of Items to be Salvaged: Prior to start of demolition, submit lists of items to be removed and salvaged as follows:

1. Items to be removed, salvaged, and delivered to Owner.
2. Items to be removed, salvaged, and reinstalled.

D. Pre-demolition Photographs: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition.

1.7 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is expected that hazardous materials will not be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

E. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

F. Storage or sale of removed items or materials on-site is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

1. If unanticipated mechanical, electrical, or structural elements are encountered and found to conflict with intended function or design, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

C. Inventory and record the condition of items to be removed and salvaged or removed and reinstalled. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

3.3 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.4 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with Owner and/or utility companies.

2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use plasma or flame cutting torches without written approval from Architect. Where allowed, clear area of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations. Maintain fire watch during and for at least two hours after flame-cutting operations. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting structures.
7. Dispose of demolished items and materials promptly, comply with requirements of Division 01 Section “Construction Waste Management and Disposal.”

B. Minor Accessories and Fixtures: Remove minor accessories and fixtures as required to accommodate removal of existing finishes or application new finishes whether items are indicated to be removed or not.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

1. Items removed, salvaged, and reinstalled for the Contractor’s convenience shall be considered the same as items to be removed and salvaged for reinstallation.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Concrete Slabs-on-Grade: Using power-driven saw, cut perimeter of area to be demolished, then break up and remove.

1. Where possible or feasible, cut concrete at existing joints.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Recycle or dispose demolition waste materials according to Division 01 Section "Construction Waste Management and Disposal." Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in accordance with local regulations and in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 031512
POST INSTALLED CONCRETE ANCHORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following types of post installed anchors:

1. Expansion anchors.
2. Sleeve anchors.
3. Drop-in anchors.
4. Adhesive anchors.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete."
2. Division 05 Section "Structural Steel Framing."
3. Division 05 Section "Metal Fabrications."

1.3 REFERENCES

A. ACI:

1. ACI 318 – Building Code Requirements for Structural Concrete
2. ACI 355.2 – Standard for Evaluating the Performance of Post-Installed Mechanical Anchors in Concrete

B. ASTM:

1. ASTM A36 – Standard Specification for Carbon Structural Steel
2. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
3. ASTM A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
4. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
5. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
6. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

7. ASTM B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
8. ASTM C881 – Standard Specification Epoxy-Resin-Based Bonding Systems for Concrete
9. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
10. ASTM E1512 – Standard Test Methods for Testing Bond Performance of Bonded Anchors
11. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

C. Federal Specifications A-A-1922A, A-A01923A and A-A-55614 for Expansion and Shield-Type Anchors

D. ICC-ES

1. ICC-ES AC01 Acceptance Criteria for Expansion Anchors in Masonry Elements
2. ICC-ES AC58 Acceptance Criteria for Adhesive Anchors in Masonry Elements
3. ICC-ES AC70 Acceptance Criteria for Fasteners Power-Driven into Concrete, Steel and Masonry Elements
4. ICC-ES AC193 Acceptance Criteria for Mechanical Anchors in Concrete Elements
5. ICC-ES AC308 Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements

1.4 SUBMITTALS

A. Product Data: For each type of product indicated; include manufacturer's written installation instructions, physical characteristics, and load tables.

B. Evaluation Reports: From ICC-ES or IAPMO ES for each type of post installed anchor indicated.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed post-installed anchor installations similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of not less than 3 years of successful in-service performance.

B. Evaluation Service Approval: Use only products that have current ICC or IAPMO Evaluation Service approval.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to job site in manufacturer's or distributor's packaging undamaged, complete with installation instructions.

B. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Carbon and Alloy Steel Nuts: ASTM A563.

B. Carbon Steel Washers: ASTM F436.

C. Carbon Steel Threaded Rod: ASTM F 1554; or ASTM A193 Grade B7; or ISO 898 Class 5.8.

D. Wedge Anchors: ASTM A510; or ASTM A108.

E. Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.

F. Stainless Steel Nuts: ASTM F594.

G. Zinc Plating: ASTM B633.

H. Hot-Dip Galvanizing: ASTM A153.

2.2 POST INSTALLED ANCHORS

A. Basis of Design: Post installed anchors shall be of manufacturer, type, and size as indicated on Drawings; manufacturers indicated on the Drawings are selected from the following:

1. Hilti Corporation.
2. Simpson Strong-Tie Company.

B. Post Installed Anchor Material:

1. Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.
2. Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts (Type 304), ASTM F 593, and nuts, ASTM F 594.

C. Expansion Anchors: Wedge type, torque-controlled, with impact section to prevent thread damage complete with required nuts and washers. Provide anchors with length identification markings conforming to ICC ES AC01 or ICC ES AC193. Type and size as indicated on Drawings.

1. Anchorage to Grouted Masonry, provide one of the following:
    a. Hilti Kwik Bolt 3, ICC ESR-1385.
    b. Simpson Strong-Tie, Strong-Bolt 2 wedge anchor, IAPMO ER-0240.

2. Anchorage to Concrete, provide one of the following:

    a. Hilti Kwik Bolt TZ, ICC ESR-1917 (carbon steel and AISI Type 304 Stainless Steel).
    b. Simpson Strong-Tie, Strong-Bolt 2 wedge anchor, ICC ESR-3037.

D. Sleeve Anchors: Torque-controlled, with impact section to prevent thread damage complete with required nuts and washers. Provide anchors with length identification markings conforming to ICC ES AC01 or ICC ES AC193. Type and size as indicated on Drawings.

1. Subject to compliance with requirements, provide anchor indicated on Drawings or one of the following:

    a. Hilti; HAD-P Undercut Anchor, ICC ESR-1546.
    b. Other Manufacturers: Submit Request for Substitution.

E. Drop-in Anchors: Flush, internally threaded shell anchor, bottom bearing type with a slotted single piece steel shell and a tapered expander plug providing 360 degree contact with the base material. Type and size as indicated on Drawings.

1. Subject to compliance with requirements, provide anchor indicated on Drawings or one of the following:

    a. Hilti; HDI Drop-in Anchor COLA (City of LA) RR 23709.
    b. Simpson Strong-Tie; Drop-In Anchor.
    c. Other Manufacturers: Submit Request for Substitution.

F. Adhesive Anchors: Two component, all weather, high performance epoxy complying with descriptive requirements of ASTM C 881, Type IV, Grade 3, Classes A, B, and C, except for gel time; mixed and dispensed through motionless, static mixing nozzle and dispensing tool. Threaded steel rod, inserts or reinforcing dowels, complete with nuts, washers, adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on Drawings.

1. Anchorage to Grouted Masonry, provide one of the following:

    a. Hilti: Threaded rods or steel reinforcing bars with HIT HY-70 Adhesive Anchorage System, ICC ESR-2682.
    b. Simpson Strong-Tie: Threaded rods or steel reinforcing bars with SET-XP Adhesive Anchorage System, IAPMO ES-0265.

2. Anchorage to Concrete, provide one of the following:

    a. Hilti: Threaded rods or steel reinforcing bars with HIT RE 500 V3 Adhesive Anchoring System, ICC ESR-3814.
    b. Simpson Strong-Tie: Threaded rods or steel reinforcing bars with SET-XP Adhesive Anchorage System, ICC ESR-2508.

G. Capsule Anchors: Threaded steel rod, inserts and reinforcing dowels with 45 degree chisel point, complete with nuts, washers, glass or foil capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, and manufacturer's installation instructions. Type and size as indicated on Drawings.

1. Subject to compliance with requirements, provide anchor indicated on Drawings or one of the following:

    a. Hilti HVA Adhesive System with HVU capsules, ICC ER-5369.
    b. Other Manufacturers: Submit Request for Substitution.

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 the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install anchors in accordance with manufacturer's written installation instructions and as indicated on Drawings.

B. Drilling Concrete and Concrete Unit Masonry:

1. Base Material Strength: Do not drill holes in concrete or masonry until concrete, mortar, and/or grout complies with the following for the type of anchor indicated:

    a. Expansion Anchors: Do not drill base material until base material has cured 28 days minimum.
    b. Adhesive Anchors: Do not drill base material until base material has cured 7 days minimum.

2. Drill holes with rotary impact hammer drills using carbide-tipped bits and core drills using diamond core bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete or masonry surface.

    a. Cored Holes: Where anchors are to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer.
    b. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging electrical and telecommunications conduit, and gas lines.

C. Wedge Anchors, Sleeve Anchors, and Undercut Anchors: Protect threads from damage during anchor installation. Sleeve anchors shall be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the

specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Architect.

D. Cartridge Injection Adhesive Anchors: Clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into 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. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

E. Capsule Anchors: Perform drilling and setting operations in accordance with manufacturer instructions. Clean all holes to remove loose material and drilling dust prior to installation of adhesive. Remove water from drilled holes in such a manner as to achieve a surface dry condition. Capsule anchors shall be installed with equipment conforming to manufacturer recommendations. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

F. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

3.3 FIELD QUALITY CONTROL

A. Testing and Inspecting Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to perform tests and inspections as applicable and prepare reports. Testing and Inspection Agency shall be acceptable to the Architect and the Division of the State Architect.

B. Contractor Responsibilities:

1. The Contractor shall maintain control of the quality of materials and workmanship in order to conform with the drawings and specifications.
2. To facilitate testing and inspection, the Contractor shall:
    a. Schedule tests and inspections with the Testing and Inspection Agency sufficiently in advance of operations to allow for the assignment of personnel and for the completion of testing and inspecting responsibilities.
    b. Provide access to the Work for the designated Testing and Inspection Agency.
3. The Contractor shall correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Testing: Each type and size of anchor shall be proof load tested by the independent testing laboratory. Adhesive anchors and capsule anchors shall not be torque tested unless otherwise directed by the Structural Engineer. If any anchor fails testing, all anchors of the same type, diameter, and which were installed by the same trade and not previously tested, shall be tested until twenty (20) consecutive anchors pass, then resume the initial test frequency.

1. Anchors shall not be tested prior to base material having cured for a minimum of 28 days and achieved design strength.
2. Minimum anchor embedment, proof loads and torques shall be as indicated on the Drawings.
3. Torque shall be applied with a calibrated torque wrench.
4. Proof loads shall be applied with a calibrated hydraulic ram. Displacement of adhesive and capsule anchors at proof load shall not exceed D/10, where D is the nominal anchor diameter.
5. Testing frequency shall be per 2022 CBC 1910A.5.3.
    a. Structural Applications: Test all anchors.
    b. Non-Structural Applications (Equipment Anchorage): Test 50 percent or alternate bolts in a group, including at least one-half the anchors in each group, shall be tested.
6. Test acceptance criteria shall be per 2022 CBC 1910A.5.5.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Grade beams.
3. Retaining walls.
4. Slabs-on-grade.
5. Elevated composite concrete and metal deck floors.
6. Integrally colored concrete.
7. Grouting of structural steel setting plates and elevator sills.

B. Related Sections:

1. Division 01 Section “Quality and Testing Requirements” for administrative and procedural requirements for quality assurance including independent testing requirements.
2. Division 03 Section "Concrete Cure-Sealer-Hardener” for finishing treatment of certain floor slabs.
3. Division 03 Section “Topical Concrete Vapor Control Barrier” for general treatment of floor slabs receiving floor coverings.
4. Division 07 Section “Underslab Vapor Retarder.”
5. Division 22 and 23 Sections as applicable to Plumbing and Mechanical items embedded in concrete.
6. Division 26 Sections as applicable to Electrical items embedded in concrete.
7. Division 31 Sections as applicable to earthwork.
8. Division 32 Sections as applicable to concrete paving and site concrete work.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated or required.

1. Form liners.
2. Waterstops.
3. Admixtures.
4. Color pigments.

B. Design Mixtures: Submit for each concrete mixture type required. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1. Shop drawings shall be in accordance with ACI SP-66 or CRSI “Manual of Standard Practice.”
2. Mill certificates: Steel producer's certificates of mill analysis, tensile, and bend tests for reinforcing steel. Submit certificates accompanying the Shop Drawings.

D. Shop Drawings:

1. Construction Joint Layout Shop Drawings: Show locations of proposed construction and control joints other than, or in addition to, those as indicated on the drawings. Location of joints is subject to approval of the Architect.
2. For exposed vertical concrete walls:
    a. Indicate dimensions and form tie locations.
    b. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301 (ACI 301M). Joint locations subject to approval by Architect/Engineer.

E. Samples:

1. Waterstops.
2. Form Liners: 12-inch by 24-inch (305-mm by 610-mm) sample, indicating texture.
3. Form ties.
4. Color selection samples for integrally colored concrete.

F. Qualification Data: For the Ready-mixed concrete manufacturer, include copies of applicable ACI certificates.

G. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.

6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Joint-filler strips.
11. Repair materials.

H. Material Test Reports: For aggregates, from a qualified testing agency, indicating compliance with requirements:

I. Mill certificates: Steel producer's certificates of mill analysis, tensile, and bend tests for reinforcing steel. Submit certificates accompanying the Shop Drawings.

J. Steel Reinforcement Record Drawings: Shop drawings shall be corrected to reflect actual field changes and shall be submitted to the Architect.

K. Welding certificates.

L. Delivery Tags: Delivery tags for all concrete.

M. Batch Plant Inspection Waiver: When batch plant inspection waiver is requested, evidence of compliance shall be submitted to, and approved by, the Governing Agency; refer to requirements in Part 3 Article “Field Quality Control.”

N. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills required for work performed under this Section. In actual installation of the work of this Section, use adequate numbers of skilled workmen to insure installation in strict accordance with the contract documents design.

B. Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer shall be certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency: An independent agency retained by the Owner, acceptable to the Architect, and qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 318-14, “Building Code Requirements for Structural Concrete” with amendments per 2019 California Building Code, Chapter 19A, Section 1905A.
3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Mockups: Cast concrete panels to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.

1. Integrally colored concrete: Minimum 4 ft. square slabs, minimum 3 colors as selected by Architect. Include cure-sealer-hardener treatment.
2. Concrete with form liner texture: Minimum 4 ft high x 8 ft long vertical panel with at least one example of each required joint feature.
3. Remove mockups from project site after completion and acceptance of corresponding permanent construction.

H. Pre-installation Conference: Conduct conference at Project site.

1. Review the following:
    a. Special inspection and testing and inspecting agency procedures for field quality control.
    b. Construction joints, control joints, isolation joints, joint-filler strips, and semi-rigid joint fillers.
    c. Vapor-retarder installation.
    d. Steel reinforcement installation.
    e. Anchor rod and anchorage device installation tolerances.
    f. Cold and hot weather concreting procedures.
    g. Concrete finishes and finishing.
    h. Curing procedures.
    i. Forms and form-removal limitations.
    j. Shoring and reshoring procedures.
    k. Methods for achieving specified floor and slab flatness and levelness.
    l. Floor and slab flatness and levelness measurements.
    m. Concrete repair procedures.
    n. Concrete protection.
    o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
    p. Protection of field cured field test cylinders.

q. Concrete mixtures, finishing, protection and curing of slabs to receive an exposed finish.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Identification: Bundle and tag reinforcing steel with grades and suitable identification marks for checking, sorting and placing. Use waterproof tags and markings and do not remove until steel is in place.

1.7 COORDINATION

A. Slab Finishes: Coordinate slab finish requirements with trades installing or applying floor finishes or treatments over slabs. Finishes shall include but not be limited to concrete sealing, topical concrete vapor control barrier, ceramic tile, resinous/fluid applied floor systems, adhered resilient floor systems, and adhered carpet.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Earth Forms: Use for sides of footings only where soil is firm and stable and concrete will not be exposed. Where earth forms are used, cut excavations neat and accurate to size for placing concrete directly against the excavation.

B. Rough-Formed Finished Concrete: Use for formed concrete that will not be exposed in the finished work, fabricate forms of plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form-Facing Panels for As-Cast Finishes: Unless otherwise indicated, use for formed concrete that will be exposed in the finished work, fabricate forms of form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

D. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments and finishes of concrete.

1. Basis of Design: Design, Drawings, and Specifications are based on the following product:

a. Sika FormLiner #465, Cedar Hi-lo Board.

E. Rustication Strips: Metal**,** dressed wood**,** or rigid plastic, with sides beveled and back kerfed; non-staining; in longest practicable lengths.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

E. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. Slabs on Grade and Foundations: Use precast concrete blocks, plastic-coated steel with bearing plates or specifically designed wire-fabric supports fabricated of plastic. Precast blocks shall be not less than 3 inches by 3 inches square and shall have a compressive strength equal to or greater than the strength of the surrounding concrete.
2. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

G. Fabricating Reinforcement: Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice" or ACI SP-66 and the details shown on the Drawings.

1. In the case of fabricating errors, do not rebend or straighten reinforcement in a manner that will damage or weaken the material.
2. Bends shall be made cold using pin sizes as recommended ACI 318 as modified by T24, CCR, Part 2.
3. Unacceptable Work: Reinforcement with any of the following defects will not be permitted:

    a. Bar lengths, depths, and bends exceeding specified fabrication tolerance.
    b. Bends or kinks not indicated on the project Drawings or the final Shop Drawings.
    c. Bars with reduced cross-section due to excessive rusting or other cause.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type II, gray.

    a. ASTM C 150, Type V where concrete will be in contact with corrosive soils or mixed with aggregates containing reactive substances. Low alkali cement shall contain no more than 0.6 percent total alkali when calculated as sodium oxide as determined by the method given in ASTM C114.
    b. Fly Ash: ASTM C 618, Class F. The use of a quality fly ash will be permitted as a cement-reducing admixture up to a maximum of 30% of the weight of portland-cement. Comply with DSA IR 19-3 when fly ash content is greater than 15%.

B. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Where concrete expansion from alkali silica or alkali carbonate reactions is anticipated, provide aggregate with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
2. Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as the combination of sizes when two or more are used, shall conform to the grading requirements of ASTM C33.
3. Coarse aggregate: Coarse aggregate shall consist of a clean, hard, fine grained, sound crushed rock, or washed gravel or a combination of both. It shall be free from oil, organic matter, or other deleterious substances. Aggregate shall be uniformly graded from one-quarter inch size to maximum size.
4. The maximum size of aggregates used in the project shall be consistent with the dimensions and form of the section being placed, the location and spacing of the reinforcing bars, and with the method of compaction, and shall be such as will produce dense and uniform concrete free from rock pockets, honey-comb and other irregularities. The nominal maximum size of the aggregate shall not be more than one-fifth the narrowest dimension between forms, one-third the depth of slabs nor three-fourths the minimum clear spacing between reinforcing bars.
5. Combined Grading: The combined grading shall be such that the percentage by weight of the combined aggregates shall fall within the limits established as follows:

Sieve number or size in inches (maximum)	Percentage by Weight		
	1-1/2”	1”	3/4”
Passing a 2 inch	---	---	---
Passing a 1-1/2 inch	95-100	---	---
Passing a 1 inch	70-90	90-100	---
Passing a 3/4 inch	50-80	70-95	90-100
Passing a 3/8 inch	40-60	45-70	55-75
Passing a No. 4	35-55	35-55	40-60
Passing a No. 8	25-40	27-45	30-46
Passing a No. 16	16-34	20-38	23-40
Passing a No. 30	12-25	12-27	13-28
Passing a No. 50	2-12	5-15	5-15
Passing a No. 100	0-3	0-5	0-5

6. Special grading or size limitations: When reviewed and approved by the Architect, other gradings or maximum size limitations may be used if mixes are designed and tested in accordance with the concrete mixture specified in the “Concrete Mixtures” Article.
7. Soundness of Aggregates: Both the coarse and fine aggregate shall be tested by the use of a solution of sodium or magnesium sulfate, or both, whenever in the judgment of the Architect, such tests are necessary to determine the quality of the material. Such tests shall be performed in accordance with ASTM C88 and the results shall show compliance with the limits set forth in ASTM C33.
8. Reactivity: Aggregates shall be free from any substance which may be deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of the concrete or which will interfere with normal hydration of the cement. Acceptability of the aggregate shall be based upon satisfactory evidence that the aggregate is free from such materials.
9. Aggregates shall be tested, when required by the Architect prior to the concrete mix being established, in accordance with the following specifications:

Test	Specification
Abrasion	ASTM C131 and C535
Gradation	ASTM C136
Alkali Reactivity	ASTM C289 and C227
Organic Impurities	ASTM C40
Clay Lumps	ASTM C142

10. Maximum Coarse-Aggregate Size: Nominal size as indicated on Drawings.
11. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

D. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments, color stable, free of carbon black, non-fading, and resistant to lime and other alkalis.

1. Acceptable Manufacturers: Subject to compliance with requirements, provide coloring pigments by one of the following:

    a. Euclid Chemical Co.; Color-Crete Integral Color.
    b. Davis Colors: Powder Pigments.
    c. Sika USA; SikaColor-100P.
    d. Solomon Colors Inc.; SGS Integral Color for Concrete.

2. Color: As selected by Architect from manufacturer's full range.

2.4 ADMIXTURES

A. Admixtures shall be reviewed and approved by the Architect/Engineer and Division of the State Architect.

B. Admixtures for concrete slabs to receive an exposed finish shall be limited to, and coordinated with, Division 03 Section “Concrete Sealer-Hardener”.

C. Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.

D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Certification of requirements and chloride ion content is required from the admixture manufacturer prior to mix design review.

1. Air-entraining Admixture: ASTM C260.

    a. Available Products: Subject to compliance with requirements and when included in mix designs, provide one of the following products:

        1) Euclid Chemical Company (The); Air Mix.
        2) BASF/Master Builders, Inc.; Micro-Air.
        3) Sika Corporation; Sika AER.

2. Water-reducing Admixtures: ASTM C494 Type A.

    a. Available Products: Subject to compliance with requirements, provide one of the following products:

        1) Euclid Chemical Company (The); Eucon WR-75.
        2) BASF/Master Builders Inc.; Pozzolith 220N.
        3) Sika Corporation; Plastocrete 161.

3. Water-reducing, Retarding Admixtures: ASTM C494 Type D.

    a. Available Products: Subject to compliance with requirements and when included in mix designs, provide one of the following products:

        1) Euclid Chemical Company (The); Eucon Retarder-75.
        2) BASF/Master Builders Inc.; Pozzolith 300 R.
        3) Sika Corporation; Plastiment.

4. High Range Water-Reducing Admixture (HRWR): ASTM C494 type F or G.

a. Available Products: Subject to compliance with requirements and when included in mix designs, provide one of the following products:

1) Euclid Chemical Company (The); Eucon 37.
2) BASF/Master Builders Inc.; Rheobuild 1000.
3) Sika Corporation; Sikament 300.

b. When more than 30 minutes is required between the addition of admixtures to final placement of the concrete, a combination of water-reducing, set controlling admixtures (ASTM C494, Types A, D and E) may be used.

5. Non-Corrosive, Non-Chloride Accelerator: ASTM C494 Type C or E.

a. Available Products: Subject to compliance with requirements and when included in mix designs, provide one of the following products:

1) Euclid Chemical Company (The); Accelguard 80.
2) BASF/Master Builders Inc.; Pozzutec 20+.
3) Sika Corporation, Plastocrete 161FL.

b. The admixture manufacturer shall have long-term (more than one-year duration) non-corrosive test data on metal deck and reinforcing steel from an independent testing laboratory using an acceptable accelerated corrosion test method such as using electrical potential measures.

2.5 WATERSTOPS

A. Flexible Rubber Waterstops: U.S. Army Corps of Engineers CRD-C 513 for embedding in concrete to prevent passage of fluids through joints, with factory fabricated corners, intersections, and directional changes.

1. Profile: As indicated.
2. Dimensions: As indicated.

2.6 CURING AND SEALING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Construction Chemicals - Building Systems; Confilm.
b. ChemMasters; SprayFilm.
c. Conspec by Dayton Superior; Aquafilm.
d. Dayton Superior Corporation; Sure Film (J-74).
e. Edoco by Dayton Superior; BurkeFilm.
f. Euclid Chemical Company (The), an RPM company; Eucobar.
g. Lambert Corporation; LAMBCO Skin.
h. L&M Construction Chemicals, Inc.; E-CON.
i. Meadows, W. R., Inc.; EVAPRE.
j. Sika Corporation; SikaFilm.
k. Symons by Dayton Superior; Finishing Aid.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, clear or white polyethylene film, 6 mil minimum thickness, or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Construction Chemicals - Building Systems; Kure 200.
b. ChemMasters; Safe-Cure Clear.
c. Conspec by Dayton Superior; W.B. Resin Cure.
d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
e. Edoco by Dayton Superior; Res X Cure WB.
f. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
g. L&M Construction Chemicals, Inc.; L&M Cure R.
h. Meadows, W. R., Inc.; 1100-CLEAR.
i. Symons by Dayton Superior; Resi-Chem Clear.

2. Curing compounds are subject to removal after curing period has elapsed; refer to Part 3 Article “Concrete Protecting and Curing.”

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Construction Chemicals - Building Systems; Kure 1315.
b. ChemMasters; Polyseal WB.
c. Conspec by Dayton Superior; Sealcure 1315 WB.
d. Edoco by Dayton Superior; Cureseal 1315 WB.
e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
f. Meadows, W. R., Inc.; Vocomp-30.
g. Symons by Dayton Superior; Cure & Seal 31 Percent E.

2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: As specified in Division 07 Section “Under-slab Vapor Retarder,” ASTM E 1745, Class A, 15 mil thickness minimum.

2.8 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semi-rigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301, ACI 318, Chapter 26, and Chapter 19 of the California Building Code.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

    a. The testing agency used for preparing mixture designs shall be different from the testing agency retained by the Owner for testing concrete strength and materials.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 30 percent, maximum. Comply with DSA IR 19-3 when fly ash content is greater than 15%.

    a. Limit fly ash to 10% maximum for concrete floor slabs with exposed finish.

C. Limit water-soluble, chloride-ion content in hardened concrete to the following percentages by weight of cement.

1. Reinforced concrete exposed to chloride in service: 0.15 percent.
2. Reinforced concrete that will be dry or protected from moisture in service: 1.00 percent.
3. Other reinforced concrete: 0.30 percent.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

E. Color Pigment: Add color pigment to concrete mixture in accordance with manufacturer's written instructions and to result in hardened concrete color consistent with approved mockups.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Proportion normal-weight concrete mixture as indicated on Drawings for strength, slump, water/cement ratio, and maximum aggregate size.

B. Proportion normal-weight concrete mixture as indicated below for strength, slump, water/cement ratio, and maximum aggregate size.

1. Slabs-on-Grade:

    a. Strength: 3,000 psi at 28 days.
    b. Aggregate Size: 3/4 inch maximum.
    c. Slump: 3.5 inches.
    d. Water Cement Ratio: 0.45 Maximum.
    e. Low shrinkage.

2. Footings, Foundation Walls:

   a. Strength: 4,000 psi at 28 days.
   b. Aggregate Size: 1 inch maximum.
   c. Slump: 3.5 inches.
   d. Water Cement Ratio: 0.50 Maximum.

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Project site mixing of structural concrete will not be permitted. Project site mixing of concrete for other purposes may be permitted only when reviewed and approved by the Architect. When allowed, measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ACI 318. Mix concrete materials in appropriate drum-type batch machine mixer, the capacity of the mixer shall be such that it will handle one or more full sack batches.

C. Control of Admixtures:

   1. Admixtures shall be charged into the mixer as solutions and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water. Admixtures that cannot be added in solution may be weighed or may be measured by volume if so recommended by the manufacturer.
   2. If two or more admixtures are used in the concrete, they shall be added separately to avoid possible interaction that might interfere with the efficiency of either admixture or adversely affect the concrete.
   3. Addition of retarding admixtures shall be completed within 1 minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first.
   4. Admixtures shall be used in accordance with the manufacturer's instructions.

D. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall not be re-tempered, but shall be discarded.

E. When concrete arrives at the project with slump below that suitable for placing, as indicated by the specifications, water may be added only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. The water shall be incorporated by additional mixing equal to at least half of the total mixing required. An addition of water shall be accompanied by a quantity of cement sufficient to maintain the proper water-cement ratio. Such addition shall be reviewed by the Architect.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

1. Where earth is used for forming sides of footings, increase the width of footings by 1 inch on each side of the footing.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.
3. Install form liners as recommended by the manufacturer.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

M. Place form liners accurately to provide finished surface texture indicated.

1. Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting.
2. Secure form liners in place using fasteners that will not transfer impressions onto surface of concrete.
3. Prevent form liners from sagging and stretching in hot weather.
4. Seal joints of form liners and form-liner accessories to prevent mortar leaks.

N. Coat form liner with form-release agent.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

B. Conduits and Pipes Embedded in Concrete:

1. Pipes, other than conduits for electrical circuits, shall not be embedded in structural concrete unless specifically reviewed and approved by the Architect and the Division of the State Architect. Any pipe or conduit may pass through any walls or floor slab by means of a sleeve so located that it does not impair the strength of the structure. Openings larger than 12 inches in any dimension shall be as detailed on the structural plans.
2. Unless otherwise approved, embedded pipes or conduits, other than those merely passing through, shall be not larger in outside dimension than one-third the thickness of the slab, wall, or beam in which they are embedded, nor shall they be spaced closer than three diameters or widths on center and shall have at least 1-1/2 inches concrete cover.
3. Sleeves, pipes, or conduits of aluminum shall not be embedded in structural concrete unless effectively coated or covered to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete must be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. Vapor retarders shall be installed in accordance with the requirements of Division 07 Section “Under-slab Vapor Retarder.”

3.5 STEEL REINFORCEMENT

A. Quality Control: Reinforcement steel and placement shall be subject to inspection and testing per Part 3 Article “Field Quality Control.”

B. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Coordinate installation of steel reinforcement with installation of vapor barrier specified in Division 07 Section “Underslab Vapor Retarder.”
2. Do not cut or puncture vapor retarder; if cut or damaged, vapor barrier shall be repaired in accordance with Division 07 Section “Below Grade Vapor Retarder.”

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

    a. Use only grooved joints for concrete surfaces that will be permanently exposed to view.

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 concrete develops random contraction cracks.

    a. Sawn joints shall not be used for concrete surfaces that will be permanently exposed to view.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONVEYING

A. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

B. Conveying equipment shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:

1. Truck mixers, agitators and non-agitating units and their manner of operation shall conform to the applicable requirements of ASTM C94.

2. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. A suitable device shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.
3. Do not use reinforcement or reinforcement supports to support runways for concrete conveying equipment.

C. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

D. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete. The loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 inches. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy. When the concrete is placed into final position by means of pumping, the pumping method for placing concrete shall be reviewed and approved by the Architect and the Division of the State Architect at least one week prior to placing the concrete.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

1. Reposition any misaligned reinforcement.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 305 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not permanently exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces permanently exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.

E. Maintain uniformity of architectural concrete finishes over construction joints unless otherwise indicated.

F. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Finishing of concrete floor slabs to receive a exposed finish shall be coordinated with division 03 Section “Concrete Cure Sealer-Hardener”.

C. Slab Finishes: Provide finished slab surfaces as indicated below; confirm and coordinate surface finishes for adhered and fluid applied floor finishes with trades installing/applying respective floor systems required for the project conditions.

	Finish Floor Application	Slab Finish Type
1.	Surfaces to receive mortar setting beds for tile flooring and similar applications.	Scratch Finish
2.	Surfaces to receive thinset tile flooring directly over concrete	Trowel and Fine Broom Finish
3.	Surfaces to receive adhered carpet, resilient sheet, or resilient tile flooring	Trowel and Fine Broom Finish
4.	Surfaces to receive epoxy or polyurethane fluid applied flooring	Light Broom Finish (Confirm with floor system manufacturer)
5.	Surfaces to be exposed and sealed concrete	Troweled Finish
6.	Ramped exposed concrete	Medium Broom Finish

7.	Surfaces to receive waterproof membranes	Floated Finish

D. Slab Flatness (F_F) and Levelness (F_L): Provide finished slab flatness and levelness as indicated below; confirm and coordinate surface finishes for floor finishes with trades installing/applying respective floor systems required for the project conditions.

	Application		Flatness (F_F)	Levelness (F_L)
1.	General Purpose (Other than exposed concrete floor areas)	Overall: Local:	30 24	25 15
2.	Slabs to receive exposed concrete finish, Coordinate with Division 03 Section “Concrete Cure Sealer-Hardener”	Overall: Local:	50 40	30 20
3.	Slabs to receive resilient flooring	Overall: Local:	30 24	25 15
4.	Slabs to receive carpet flooring	Overall: Local:	25 17	20 15
5.	Other areas not specified	Overall: Local:	25 17	20 15

E. Sloped Slab Finishes: Where slabs are indicated to be sloped, finished slabs shall have a slope not to exceed 1/4 inch per one foot (2%) unless otherwise indicted on the Drawings.

F. Slab Finish Types: Slab finish types shall be as follows:

1. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
2. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.
3. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Trowel and Fine-Broom Finish: After applying a trowel finish and while concrete is still plastic, slightly scarify surface with a fine broom to produce a fine directional finish.

5. Broom Finish: Immediately after float finishing, slightly roughen surface by brooming with fiber-bristle broom perpendicular to main traffic route and/or ramp surfaces. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days using a water saturated absorptive cover kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

a. This method shall not be used on floor slabs receiving adhered floor systems, fluid applied floor systems, or sealers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 LIQUID FLOOR TREATMENTS

A. Apply topical curing/sealer/vapor control compounds to floor slabs as specified in other Division 03 and 09 sections and where indicated on Drawings.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

   1. Defer joint filling as long as possible and until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Repair damaged finished surfaces of cast-in-place architectural concrete when repairing is approved by Architect.
2. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved sample panels or mockups.
3. Remove and replace cast-in-place architectural concrete that cannot be repaired to Architect's approval.
4. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
    a. Limit cut depth to 3/4 inch.
    b. Make edges of cuts perpendicular to concrete surface.
    c. Perimeters of cut areas shall be square or rectangular in shape with cuts vertical and horizontal.
    d. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
5. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
6. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to perform tests and inspections as applicable and prepare reports.

1. Testing and Inspection Agency shall be acceptable to the Architect and the Division of the State Architect.

B. The Architect and the Division of the State Architect shall have the right to order the testing of any materials used in the concrete construction to determine if they are of the quality specified.

C. Contractor Responsibilities:

1. The Contractor shall maintain control of the quality of materials and workmanship in order to conform with the drawings and specifications.
2. To facilitate testing and inspection, the Contractor shall:

a. Schedule tests and inspections with the Testing and Inspection Agency sufficiently in advance of operations to allow for the assignment of personnel and for the completion of testing and inspecting responsibilities.
b. Provide access to the Work for the designated Testing and Inspection Agency.
c. Furnish all necessary materials and labor to assist the designated Testing and Inspection Agency in obtaining and handling samples at the project or other sources of materials.
d. Provide and maintain for the sole use of the Testing and Inspection Agency adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the first 24 hr. as required by ASTM C31.

3. The Contractor shall correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Testing and Inspection Services:

1. Testing and inspections shall be performed by the designated Testing and Inspection Agency.

2. Testing and inspections shall be in accordance with the 2019 California Building Code, Section 1705A.3 and Table 1705A.3, DSA Statement of Structural Tests and Inspections form DSA 103, Structural Drawings Special Inspection Criteria, and shall include but not be limited to the following:

a. Inspection of steel reinforcement.
b. Inspection of headed bolts and studs prior and during concrete placement.
c. Verification of use of required design mixture.
d. Sampling of concrete for strength tests, slump, air content, and temperature of concrete at time of placement.
e. Inspection of concrete placement, including conveying and depositing.
f. Inspection of curing procedures and maintenance of curing temperature.
g. Verification of concrete strength before removal of shores and forms from beams and slabs.
h. Inspection of formwork.

E. Sampling and Testing of Steel Reinforcement:

1. Samples of reinforcing steel shall be taken by a designated approved testing agency at place of distribution prior to shipment or at project site.
2. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number and provided the mill analyses accompany the report, one tensile test and one bend test shall be made from a specimen from each 10 tons or fraction thereof of each size of reinforcing steel.

a. Where positive identification of the heat number cannot be made or where random samples are to be taken, one series of tests shall be made from each 2-1/2 tons or fraction thereof of each size of reinforcing steel.

3. Each sample shall consist of no fewer than two pieces, each 18 inches long, of each size and grade or reinforcing steel.

F. Batch Plant Inspection: The quality and quantity of materials used in transit mixed concrete and in batched aggregates shall be continuously inspected at the location where materials are measured by an approved Testing and Inspection Agency.

1. Waiver of Batch Plant Inspection: Batch plant inspection will not be required under the following conditions:

    a. The concrete plant complies fully with the requirements of ASTM C94, Sections 8 and 9, and has a current certificate from the National Ready Mixed Concrete Association. The certification shall indicate that the plant has automatic batching and recording capabilities.
    b. The Testing Agency shall check the first batching at the start of work and furnish mix proportions to the licensed weighmaster.
    c. Licensed weighmaster shall positively identify materials as to quantity and certify to each load by a ticket.
    d. Tickets shall be transmitted to the Contractor by cement truck driver with load identified thereon. Do not accept loads without a load ticket identifying the mix; Contractor shall keep a daily record of placements identifying each truck, its load and time of receipt, and approximate location of deposit in the structure and will transmit a copy of the daily record to the Architect.
    e. At the end of the project, the weighmaster shall furnish an affidavit to the Architect certifying that all concrete furnished conforms in every particular to proportions established by mix designs.
    f. The Testing Agency shall certify and submit evidence of compliance to the governing agency Division of the State Architect and obtain governing agency's approval prior for a waiver of batch plant inspection prior to mixing the concrete.

G. Placement Record: A record shall be kept on-site of the time and date of placing the concrete in each portion of the structure. Such record shall be kept until the completion of the structure and shall be open to the inspection of the governing agency (Division of the State Architect).

H. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 and 2019 CBC 1905A.1.15 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture but not less than one sample for each 50 cu. yd. or fraction thereof and one sample for each 2,000 square feet of slab area.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.
    a. Cast and laboratory cure four standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at 7 days for information and two cured specimens at 28 days for strength acceptance, the fourth specimen shall be held in reserve in case additional testing in necessary.
    a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
8. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7 and 28-day tests.
9. Non-destructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
11. Additional testing and inspecting will be performed to determine compliance of replaced or additional work with specified requirements.
    a. The cost of additional testing and inspection of replaced work will be paid for by the Owner with the amount being deducted from the Contract Amount by a Change Order.

3.17 PROTECTION OF SEALED FLOORS

A. Protect sealed floor surfaces from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by floor treatment installer.

3.18 FINAL ACCEPTANCE

A. Final acceptance of completed architectural concrete Work will be determined by Architect by comparing approved design reference sample, sample panels or mockups with installed Work, when viewed at a distance of 20 feet (6 m).

END OF SECTION

SECTION 033518
CONCRETE CURE-SEALER-HARDENER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single application cure-sealer-hardener for new concrete floors.
2. Single application sealer-hardener for cured concrete floors.
3. Precautions for avoiding staining concrete before and after application.

B. Related Sections:

1. Division 03 Section “Cast-In-Place Concrete.”

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
2. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
3. ASTM C805 Standard Test Method for Rebound Number of Hardened Concrete.
4. ASTM C1028 Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
5. ASTM D3359 Standard Test Methods for Measuring Adhesion by Tape Test.
6. ASTM G23 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials (Withdrawn 2000).

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For qualified installer.

C. Maintenance Data: Maintenance instructions, including precautions for avoiding staining after application.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is certified in writing by manufacturer as qualified to install manufacturer's products.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

1.6 DELIVERY, STORAGE & HANDLING

A. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

C. Handling: Protect materials from dirt, corrosion, oil, grease and other contaminants.

PART 2 - PRODUCTS

2.1 CURE-SEAL-HARDENER

A. Basis of Design: Drawings and Specifications are based on the following:

1. Curecrete Distribution, Inc.; Ashford Formula.

a. Subject to compliance with requirements, submit specified product or a comparable product subject to request for substitution.

B. Cure-Seal-Hardener: Water-based chemically reactive penetrating sealer and hardener that seals by densifying concrete so that water molecules cannot pass through but air and water vapor can, and allows concrete to achieve full compressive strength, minimizing surface crazing and eliminating dusting.

1. Abrasion Resistance to Revolving Disks: At least a 32.5% improvement over untreated samples when tested in accordance with ASTM C779.
2. Surface Adhesion: At least a 22% increase in adhesion for epoxy when tested in accordance with ASTM D3359.
3. Hardening: As follows when tested in accordance with ASTM C39:

a. After 7 Days: An increase of at least 40% over untreated samples.
b. After 28 Days: An increase of at least 38% over untreated samples.

4. Coefficient of Friction: 0.86 dry, 0.69 wet when tested in accordance with ASTM C1028.
5. Rebound Number: An increase of at least 13.3% over untreated samples when tested in accordance with ASTM C805.
6. Light Exposure Degradation: No evidence of adverse effects on treated samples when tested in accordance with ASTM G23.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for conditions affecting performance of the Work of this Section.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 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.

C. Do not use frozen material. Thaw and agitate prior to use.

D. If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid or other liquids.

3.3 INSTALLATION

A. General: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

1. Apply cure-seal-hardener to exposed interior concrete floor slabs indicated to have a sealed concrete finish.

B. New Concrete: Apply cure-seal-hardener to new concrete as soon as the concrete is firm enough to work on after troweling.

1. Spray on at rate of 200 ft^2/gal (5 m^2/L).
2. Keep surface wet with cure-seal-hardener for a minimum soak-in period of 30 minutes without allowing it to dry out or become slippery. In hot weather, slipperiness may appear before the 30 minute time period has elapsed, if slipperiness occurs, apply additional cure-seal-hardener as needed to keep the entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state. In hot weather conditions, follow manufacturer's special application procedures.
3. When the treated surface becomes slippery after this period, lightly mist with water until slipperiness disappears.
4. Wait for surface to become slippery again, and then flush entire surface with water to remove all cure-seal-hardener residue.
5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
6. Wet vacuum or scrubbing machines may be used in accordance with

manufacturer’s instructions to remove residue.

C. Cured Concrete: Apply cure-seal-hardener only to clean bare concrete.

1. Thoroughly remove previous treatments, laitance, oil and other contaminants.
2. Saturate surface with cure-seal-hardener; re-spray or broom excess onto dry spots.
3. Keep surface wet with cure-seal-hardener for a minimum soak-in period of 30 to 40 minutes.
4. If most of the material has been absorbed after the 30 minute soak-in period, remove all excess material, especially from low spots, using broom or squeegee.
5. If most of the material remains on the surface after the 30 minute soak-in period, wait until the surface becomes slippery and then flush with water, removing all cure-seal-hardener residue. Squeegee completely dry, flushing any remaining slippery areas until no residue remains.
6. If water is not available, remove residue using squeegee.

3.4 PROTECTION

A. Protect installed floors for at least 3 months until chemical reaction process is complete.

1. Do not allow traffic on floors for 3 hours after application.
2. Do not allow parking of vehicles on concrete slab.
3. If vehicles must be temporarily parked on slab, place dropcloths under vehicles during entire time parked.
4. Do not allow pipe cutting using pipe cutting machinery on concrete slab.
5. Do not allow temporary placement and storage of steel members on concrete slabs.
6. Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.
7. Clean floor regularly in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 033910
TOPICAL CONCRETE VAPOR CONTROL BARRIER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface applied penetrating moisture barrier treatments for newly poured concrete slabs on grade.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for concrete mixtures, placement, and finishing.
2. Division 09 Section "Flooring Moisture and Alkalinity Testing" for concrete slab moisture and alkalinity testing.
3. Division 09 Sections as applicable to adhered floor systems.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include manufacturer’s specification data, installation instructions, and statement of VOC content.

B. Reports: Laboratory test reports.

C. Digital Photographs: Digital photography of completed installation, including surface preparation of concrete slabs.

D. Qualification Data: For qualified Applicator.

E. Field quality-control reports by manufacturer’s technical representative.

F. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

B. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

A. Limitations: Proceed with application only when existing and forecasted weather and substrate conditions permit product to be applied according to manufacturers' written instructions and warranty requirements.

1. Do not apply when concrete surface temperatures are below 40 degrees F or above 90 degrees F; concrete surface temperatures shall not exceed these limits prior, during and after application for 48 hours.
2. Do not apply products to unprotected surfaces or when water has accumulated on the surface of the concrete.
3. Allow continuous ventilation and indirect air movement during application and curing process.

1.6 COORDINATION

A. Coordinate with Work of the following Sections:

1. Division 03 Section “Cast-in-Place Concrete:”
    a. Review concrete mixture design; water/cement ratio shall not exceed 0.44 for concrete slabs on grade.
    b. Review finishing of concrete slabs; slabs shall be finished as specified by topical vapor control barrier manufacturer.
2. Division 07 Section “Underslab Vapor Retarder:” Concrete slabs-on-grade shall be poured directly over a vapor barrier complying with ASTM E1745, Class A requirements and having a permeance rating not exceeding 0.025 Perms per ASTM E96.
3. Division 09 Section “Flooring Moisture and Alkalinity Testing:” Review and coordinate preparation of concrete slabs on grade with testing requirements and preparation procedures.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree to repair or replace materials that fail to maintain requirements specified in "Performance Requirements" Article within specified warranty period.

1. In the event floor coverings are damaged due to failure of products or application of products specified in this Section and independent testing results verify water vapor emission and/or alkalinity values in excess of the limits specified, manufacturer and installer shall repair or replace barrier, floor coverings, wall base, adhesives, and patching compounds at no cost to Owner. Warranty shall not list upper moisture or alkalinity levels. Warranty shall not exclude cracks, concrete cohesive failure, ACI 318, ACI 201, dew point, concrete salts or silicates contamination.

B. Warranty Period: Fifteen (15) years from date of Substantial Completion.

C. Liability Insurance: Manufacturer shall provide product liability insurance in the amount of one million dollars ($1,000,000) per occurrence, listing Architect and Owner as additional insured. Sub-contractor general liability certificates are not acceptable.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. VOC Content of Floor Coatings and Primers: Floor coatings and primers must not exceed VOC content limits established by South Coast Air Quality Management District (SCAQMD) Rule 1113 Architectural Coating when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24).

1. Floor Coatings and Primers: 100 g/L.

2.2 TOPICAL CONCRETE VAPOR CONTROL BARRIERS FOR NEW CONCRETE

A. Description: Two-Component, spray applied product for application to newly poured concrete slabs on grade during final troweling process and designed to suppress water vapor emission, alkalinity, and relative humidity rates from concrete. Material shall be a polymer (non-silicate) based penetrating, film forming barrier that remains compatible with flooring adhesives.

1. Basis of Design: Drawings and specifications are based on the following:
    a. Synthetics International; Synthetic 10TR.
        1) Subject to compliance with requirements, provide the product indicated or an equivalent product subject to request for substitution.

2. Performance Requirements: Applied product systems shall meet performance requirements indicated without failure due to defective manufacture or installation.
    a. Relative Humidity: Suppress 100 percent relative humidity in accordance with ASTM F2170.
    b. Water Vapor Transmission Rate (WRT), ASTM E96:
        1) Grains/sf/hour: 0.60 to 1.0 or less.
        2) Pounds/1,000 sf/24 hours: 2.0 to 3.3 or less.
        3) Grams/hour per square meter: 0.40 to 0.70 or less.
    c. Water Vapor Permeance (WVP), ASTM E96:
        1) Perm (inch-pound): 1.4 to 2.4.
        2) Grams/Pa s m2 x 10 (-8): 8.1 to 13.6.
        3) Nanograms/Pa s m2: 81.1 to 136.3.
    d. Vapor Emission Testing, ASTM F 1869: Not more than 3 lbs.
    e. Alkali Resistance, ASTM D1308: 100% resistant to 30 day exposure to 14 pH and 35% potassium hydroxide resistant.
    f. Alkalinity Control: Suppress 14 pH without damage per ASTM F710.

g. Concrete Adhesion: 100% concrete cohesive failure in accordance with ASTM FD4541 pull-off adhesion tester.

3. Physical Properties:

a. Product Type: Water based.
b. Product Color: White, dries clear.
c. Solids Content: 37 percent by volume.
d. Thickness: 4 to 6 mills, WFT.
e. Material Mixture: Two-component.
f. Number of Coats: Two coat application.
g. Spread Rate: 250 to 350 square feet per gallon per coat.
h. Flooring Ready: 7 days.
i. Foot Traffic: 10 to 12 hours.
j. Product Odor: Slight odor.
k. Environmental: Non-corrosive, water based, water clean up product.
l. Product passes the California Department of Health Services Section 01650 Toxic VOC testing.
m. Product shall mix easily with concrete cement paste.
n. Product is not classified as a marine pollutant.
o. Product shall not contain hazardous air pollutants.
p. Volatile Organic Compounds (VOC) Content: 35 g/liter per EPA Method 24.

2.3 TOPICAL CONCRETE VAPOR CONTROL BARRIERS FOR CURED CONCRETE

A. Description: Liquid applied, two-component epoxy-based product for application to properly prepared existing concrete slabs on grade and designed to suppress water vapor emission, alkalinity, and relative humidity rates from concrete. Material shall be a polymer (non-silicate) based penetrating, film forming barrier that remains compatible with flooring adhesives.

1. Basis of Design: Drawings and specifications are based on the following:

a. Synthetics International; Synthetic 30.

1) Subject to compliance with requirements, provide the product indicated or an equivalent product by one of the following:

a) Diamond Stone Products.
b) Ardex Moisture Control.

2. Performance Requirements: Applied product systems shall meet performance requirements indicated without failure due to defective manufacture or installation.

a. Relative Humidity: Suppress 100 percent relative humidity in accordance with ASTM F2170.
b. Water Vapor Transmission Rate (WRT), ASTM E96:

1) Grains/sf/hour: 0.60 to 1.0 or less.
2) Pounds/1,000 sf/24 hours: 2.0 to 3.3 or less.
3) Grams/hour per square meter: 0.40 to 0.70 or less.

c. Water Vapor Permeance (WVP), ASTM E96:

1) Perm (inch-pound): 1.4 to 2.4.
2) Grams/Pa s m2 x 10 (-8): 8.1 to 13.6.
3) Nanograms/Pa s m2: 81.1 to 136.3.

d. Vapor Emission Testing, ASTM F 1869: Not more than 3 lbs.
e. Alkali Resistance, ASTM D1308: 100% resistant to 30 day exposure to 14 pH and 35% potassium hydroxide resistant.
f. Alkalinity Control: Suppress 14 pH without damage per ASTM F710.
g. Concrete Adhesion: 100% concrete cohesive failure in accordance with ASTM FD4541 pull-off adhesion tester.

3. Physical Properties:

a. Product Type: Water based epoxy.
b. Product Color: Clear or white.
c. Solids Content: 40 to 50 percent by volume.
d. Thickness: 6 - 10 mills, DFT.
e. Material Mixture: Two-component.
f. Number of Coats: Two coat application.
g. Spread Rate: 250 square feet per gallon per coat.
h. Flooring Ready: 24 to 48 hours.
i. Foot Traffic: 10 to 12 hours.
j. Product Odor: Slight odor.
k. Environmental: Non-corrosive, water based, water clean up product.
l. Product passes the California Department of Health Services Section 01650 Toxic VOC testing.
m. Product is non-corrosive, non-combustible, non-flammable, and non-hazardous to installers.
n. Product is not classified as a marine pollutant.
o. Volatile Organic Compounds (VOC) Content: 35 to 65 g/liter per EPA Method 24.

4. Product shall be primed and coated with a 1/8 inch thick cementitious topcoat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Review approved concrete mix design and examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Coordinate slab finish of new concrete slabs with Division 03 Section “Cast-in-Place Concrete.” New concrete slabs are to be finished with a light broom finish or prepared in accordance with requirements for existing concrete slabs.

3.3 APPLICATION, GENERAL

A. Manufacturer's Field Service Representative: Engage a factory-authorized service representative to inspect the substrate before application of surface treatment, to instruct Applicator on the product and application method to be used, and to supervise the product application.

B. Areas of Application: Apply topical concrete vapor control barrier to surfaces of concrete slabs-on-grade that are scheduled to receive adhered flooring products.

3.4 APPLICATION TO FRESH CONCRETE

A. Topical concrete vapor control barrier shall be applied in replacement of standard curing, sealing and hardening compounds.

B. Mix and apply product in accordance with manufacturer’s written installation instructions.

C. Apply topical concrete vapor control barrier to concrete surfaces when final power troweling of concrete is to begin. Apply by electric sprayer and provide even coverage over entire substrate.

1. Apply 1 coat at a spread rate of 250 to 350 sf/gallon for each coat.
2. Where concrete slab areas are inaccessible to power trowel equipment, apply one coat at the beginning of hand troweling operations.

D. Protect from walking traffic for 12 hours and heavy traffic for 36 hours.

3.5 APPLICATION TO CURED CONCRETE

A. Preparation of Cured Concrete Slabs: Before application of surface treatment, clean substrate of substances that could impair penetration or performance of product according to manufacturer's written instructions and as follows:

1. Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents.
2. Use a high-volume blower to remove surface sand and dirt and/or rinse with clean water to remove debris. Proceed with application when concrete surface is clean and dry.
3. Surfaces shall be clean and free of mud, dirt and contamination for other trades.
4. Shot blast floors to an ICRI # 4 using #420 shot and grind near edges.

B. Mix and apply product in accordance with manufacturer’s written installation instructions.

C. Crack and Joint Treatment: Seal all cracks and joints with product during initial application.

D. Apply topical concrete vapor control barrier by electric sprayer and/or roller, spread evenly over entire substrate, cracks, joints and penetrations by flat squeegee and back roll with lint free nap roller.

1. Apply two coats at a spread rate of 250 sf/gallon per coat.

E. Apply manufacturer's approved primer and a nominal 1/8 inch cementitious topcoat over all barrier surfaces.

1. Cementitious topcoat is required for warranty extension for future flooring updates by Owner.

F. Protect from walking traffic for 12 hours and heavy traffic for 36 hours.

3.6 FIELD QUALITY CONTROL

A. Building shall be acclimated to the working environment of the Owner for not less than 2 weeks prior to field quality control testing.

B. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and prepare test reports directly on control barriers surface.

C. Testing shall be as specified in Division 09 Section "Flooring Moisture and Alkalinity Testing." Testing shall be performed after curing of concrete and vapor control system, and shall include the following tests:

1. Moisture vapor emission, ASTM F 1869.
2. Relative Humidity, ASTM F 2170.
3. Alkalinity-pH, ASTM F710.

D. Prior to testing, do not sand or grind concrete surfaces that have applied topical concrete vapor control barriers.

E. Test results shall be forwarded to the manufacturer for warranty registration.

F. Treated areas having a vapor emissions rate exceeding flooring product requirements for moisture and pH-Alkalinity shall be resealed at no additional cost to the owner.

3.7 CLEANING, PROTECTION, AND REPAIR

A. Immediately clean product from adjoining surfaces and surfaces soiled or damaged by application as work progresses. Correct damage to work of other trades caused by application.

B. Comply with manufacturer's written cleaning instructions.

C. Do not allow foot or wheel traffic after application for time periods recommended in writing by manufacturer.

D. Repair areas damaged during construction to allow a curing time of approximately 5 days prior to installing floor coverings.

END OF SECTION

SECTION 042200
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Mortar and grout.
3. Reinforcing steel.
4. Miscellaneous masonry accessories.

B. Related Sections include the following:

1. Division 03 Section “Post Installed Concrete Anchors” for post installed anchors used in masonry.
2. Division 03 Section “Cast-in-Place Concrete” for footings for masonry walls.
3. Division 07 Section “Joint Sealants” for sealants for masonry wall control joints.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

C. Samples for Initial Selection: For the following:

1. Decorative concrete masonry units, in the form of small-scale units.
2. Pre-faced CMU’s.
3. Colored mortar.

D. Samples for Verification: For each type and color of the following:

1. Exposed concrete masonry units.

2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
3. Accessories embedded in masonry.

E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780 for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019 for grout mixes required to comply with compressive strength requirement.

G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

H. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as directed by Architect.
2. Approval of mockups is for color, texture, and blending of masonry units; tooling of joints; and aesthetic qualities of workmanship.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Sections applicable to project meetings.

1.5 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.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 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. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, 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.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. 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.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

1. Determine net-area compressive strength (f'm) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.4 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless otherwise indicated.

B. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2,000 psi.
2. Density Classification: Medium weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

a. 8 x 8 x 16 inch nominal, 7 5/8 x 7 5/8 x 15 5/8 inch actual.

4. Exposed Faces: Precision face.

5. Color: Manufacturer's standard gray.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

D. Masonry Cement: ASTM C 91.

E. Mortar Cement: ASTM C 1329.

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Davis Colors; True Tone Mortar Colors.
b. Approved equivalent.

G. Colored Cement Product: Packaged blend made from portland cement and lime, masonry cement, or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
4. Products:

    a. Colored Portland Cement-Lime Mix:

        1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
        2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
        3) Lafarge North America Inc.; Eaglebond.
        4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
        5) Or approved equal.

    b. Colored Masonry Cement:

        1) Capital Materials Corporation; Flamingo Color Masonry Cement.
        2) Essroc, Italcementi Group; Brixment-in-Color.
        3) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
        4) Lafarge North America Inc.; Florida Custom Color Masonry or Magnolia Masonry Cement.
        5) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
        6) National Cement Company, Inc.; Coosa Masonry Cement.
        7) Or approved equal.

    c. Colored Mortar Cement:

        1) Lafarge North America Inc.; Magnolia Superbond Mortar Cement.
        2) Or approved equal.

H. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Aggregate for Grout: ASTM C 404.

J. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 and as indicated on the Drawings.

2.7 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of shape and dimensions indicated.

B. Postinstalled Anchors: Provide anchors as indicated on Drawings.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4) for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.9 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.
d. Approved equivalent.

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
3. Limit cementitious materials in mortar for exterior and reinforced masonry to portland cement, mortar cement, and lime.
4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide Type S mortar unless another type is indicated or needed to provide required compressive strength of masonry. Refer Structural Drawings for additional requirements.

D. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry. Refer Structural Drawings for additional requirements.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
4. For interior non-load-bearing partitions, Type O may be used instead of Type N.

E. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
2. Mix to match Architect's sample.

F. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.

G. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 10 inches as measured according to ASTM C 143/C 143M or with slump as indicated on Drawings.

2.11 SOURCE QUALITY CONTROL

A. Testing and Inspecting Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to perform tests and inspections as applicable and prepare reports.

1. Testing and Inspection Agency shall be acceptable to the Architect and the Division of the State Architect.

B. Concrete Masonry Unit Test: For each type of unit furnished, test per ASTM C 140.

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.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

C. 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.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 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.

B. 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.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. 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 exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 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.

B. Bond Pattern: 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.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar.

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.

3.5 MORTAR BEDDING AND JOINTING

A. Lay concrete masonry units 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. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

1. Tool exterior joints with a horizontal rake.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

D. Any mortar joints that are cracked or not bonded with the face shells of the CMUs are to be removed and joints repointed prior to grout placement.

3.6 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

1. Locate joints as indicated on Drawings.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.

4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.7 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Masonry Construciton: Comply with requirements in TMS 602/ACI 530.1/ASCE 6 and 2019 CBC Sections 2104A.1, 2104a.1.3, and 2104A.1.3.1.2.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 and 2019 CBC Section 2104A.1.3.1.2 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 48 inches.
3. High lift grouting shall only be allowed with prior written approval by the enforcing agency.

3.8 FIELD QUALITY CONTROL

A. Testing and Inspecting Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to perform tests and inspections as applicable and prepare reports.

1. Testing and Inspection Agency shall be acceptable to the Architect and the Division of the State Architect.

B. The Architect and the Division of the State Architect shall have the right to order the testing of any materials used in the masonry construction to determine if they are of the quality specified.

C. Contractor Responsibilities:

1. The Contractor shall maintain control of the quality of materials and workmanship in order to conform with the drawings and specifications.
2. To facilitate testing and inspection, the Contractor shall:

a. Schedule tests and inspections with the Testing and Inspection Agency sufficiently in advance of operations to allow for the assignment of personnel and for the completion of testing and inspecting responsibilities.
b. Provide access to the Work for the designated Testing and Inspection Agency.
c. Furnish all necessary materials and labor to assist the designated Testing and Inspection Agency in obtaining and handling samples at the project or other sources of materials.
d. Provide and maintain for the sole use of the Testing and Inspection Agency adequate facilities for safe storage and proper curing of test specimens on the project site.

3. The Contractor shall correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Testing and Inspection Services:
1. Testing and inspections shall be performed by the designated Testing and Inspection Agency.
2. Testing and inspections shall be in accordance with the 2019 California Building Code, Section 1705A.4, TMS 402-13, ACI 530-13, ASCE 5-13 Table 3.1.2 (Level B), and DSA Testing and Inspections form DSA 103.
3. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
4. Place grout only after inspectors has verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
5. Place grout only after inspectors have verified proportions of site-prepared grout.

E. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

F. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

G. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

H. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

I. Additional testing and inspecting will be performed to determine compliance of replaced or additional work with specified requirements.

1. The cost of additional testing and inspection of replaced work will be paid for by the Owner with the amount being deducted from the Contract Amount by a Change Order.

3.9 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.10 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site and recycle or legally dispose of off Owner’s property.

END OF SECTION

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing.
4. Floor joist framing.
5. Roof rafter framing.
6. Ceiling joist framing.
7. Soffit framing.

B. Related Sections include the following:

1. Division 03 Section “Post Installed Concrete Anchors” for post installed anchors in concrete and/or masonry.
2. Division 05 Section "Metal Fabrications" for miscellaneous framing with steel angles, channels, plates, and shapes.
3. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 STANDARDS AND REFERENCES

A. California Code of Regulations, Title 24, Part 2, California Building Code, 2022 Edition.

B. American Iron and Steel Institute (AISI) Specifications and Standards. Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Standard for Cold-formed Steel Framing – Header Design.
2. Standard for Cold-formed Steel Framing – Lateral Design.
3. Standard for Cold-formed Steel Framing – Wall Stud Design.

C. ASTM International (ASTM):

1. ASTM A 653, Steel Sheet, Zinc Coated (galvanized) or zinc-iron alloy-coated by the Hot Dip Process, Physical (Structural) Quality.
2. A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
3. C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases.
4. A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
5. ASTM A 1008, Steel Sheet, Cold-Rolled, Carbon, Structural, High Strength, Low Alloy with improved formability.
6. ASTM A 1011, Sheet & Strip, Hot-Rolled, Carbon, Structural, High Strength, Low Alloy with improved formability.
7. ASTM C 645, Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
8. ASTM C 754, Installation of Steel Framing Members to Receive Screw Attached Gypsum Board.
9. ASTM C 1007, Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
10. C1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

D. Federal Specifications:

1. FF-P-395, Pin, Drive, Guided and Pin Drive, Power Actuated (Fasteners for Power Actuated and Hand Actuated Fastening Tools.
2. FF-S-325, Shield, Expansion: Nail, Expansion: and Nail, Drive Screw (Devices, Anchoring Masonry).

E. American Welding Society (AWS) Publication:

1. D1.1, Structural Welding Code, Steel.
2. D1.3, Structural Welding Code, Sheet Steel.

F. Metal Lath/Steel Framing Association (ML/SFA) Publication:

1. ML/SFA 540, Lightweight Steel Framing Systems.
2. ML/SFA 541, Selection Guidelines: Lightweight Steel Framing.
3. ML/SFA 920, Guide Specifications for Metal Lathing and Furring.

G. Steel Stud Manufacturers Association (SSMA):

1. Product Technical Information, ICC ESR-3064P.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, include manufacturer’s written installation procedures and details.

1. Provide documentation that stud and track members are certified in accordance with the product certification program of the Steel Framing Industry Association (SFIA) or a similar organization that provides a verifiable code compliance program.

B. Evaluation Reports: From ICC-ES or IAPMO ES, or certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 accreditation criteria, for the following:

1. Metal framing.
2. Post installed concrete anchors.
3. Powder-actuated fasteners.
4. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

C. Welding certificates (If products will be welded).

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Use adequate number of skilled workmen who are thoroughly trained and experienced in the erection of cold formed steel framing and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling. Cover stored metal framing with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. California Expanded Metal Products Company (CEMCO).
2. ClarkDietrich.
3. MarinoWare; a Division of Ware Industries.
4. SCAFCO Corp.

2.2 PERFORMANCE REQUIREMENTS

A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, comply with AISI S100, AISI S240, AISI S400, and the following:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

B. Fire-Resistance Ratings: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

2.3 COLD FORMED METAL FRAMING MEMBERS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Identification of Metal Framing Members: Load bearing cold formed steel framing members shall be identified as required by 2019 CBC Section 2202 or CBC 2202A for projects governed by the Division of the State Architect.

C. Framing Members General: Comply with AISI S200, AISI S240, and ASTM C 955, Section 8 for conditions indicated.

D. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, or ASTM A653/A653M, metallic coated, of grade and coating weight as follows:

1. Grade:

a. ST33H, 33 KSI for members 18 gauge (0.043 inch) and lighter in thickness.
b. ST50H, 50 KSI for members 16 gauge (0.054 inch) and heavier in thickness.

2. Coating: G60 or equivalent.

E. Steel Sheet for Vertical Deflection and/or Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1 or 2.
2. Coating: G90.

F. Framing Members, General: Comply with ASTM C 955 for conditions indicated.

G. Steel Studs and Joists: Manufacturer's standard C-shaped steel studs and joists of web depths indicated, stiffened flanges, and as follows:

1. Studs: Punched openings regularly spaced along webs.
2. Joists: Un-punched webs.
3. Minimum Base-Metal Thickness: As indicated on Drawings.

4. Flange Width: As indicated on Drawings, 1-5/8 inches minimum.
5. Section Properties: As indicated on Drawings.

H. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches unless otherwise indicated.

I. Steel Headers: Manufacturer's standard C-shapes or L-shapes, matching studs, used to form header beams, of web depths indicated, punched, with stiffened flanges, and as indicated on the Drawings.

J. Deflection Track: Single or double deflection track as indicated on Drawings.

1. Single Deflection Track: Manufacturer's deflection track as indicated on Drawings; single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, minimum base metal thickness matching studs.
2. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges, minimum base metal thickness matching studs. Outer track to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure

K. Vertical Deflection Clips: Manufacturer's standard bypass or head clips as indicated on Drawings, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

L. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: Conform to ASTM A307.

C. Post Installed Concrete Anchors: Fabricated from corrosion-resistant materials; manufacturer, size, and type as indicated on Drawings, and as specified in Division 03 Section “Post Installed Concrete Anchors.”

D. Power-Actuated Fasteners: Fastener of manufacturer, size, and type as indicated on Drawings and as follows:

1. Concrete Attachment: Hilti X-U (ICC ESR-2269) pins unless otherwise indicated on Drawings; 0.157 inch diameter steel pins with steel washers; embedment of steel pins into concrete shall not be less than 1-1/4 inch.
2. Steel Attachment: Hilti X-U 15 (ICC ESR-2269) unless otherwise indicated on Drawings; 0.145 inch diameter steel pins with steel washers; protrusion of steel pins through steel members shall not be less than 1/4 inch.

E. Screw Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: E60XX electrodes complying with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Nonmetallic, Nonshrink Grout: Factory packaged, nonmetallic, noncorrosive, nonstaining grout complying with ASTM C 1107, with fluid consistency and 30-minute working time.

C. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and assemblies plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 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 Shop Drawings, with screws penetrating joined members by not less than three exposed screw threads.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

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 finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION OF FRAMING, GENERAL

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 according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop or field-fabricated cold-formed framing assemblies and securely anchor to supporting structure. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding or screw fastening. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 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 Drawings and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in applicable Division 07 Section, in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

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.

3.4 WALL FRAMING

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings indicated on Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as indicated on Drawings, spacing shall not to exceed 24 inches on center.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings as indicated on Drawings with not less than double studs at each side of jambs. Fasten jamb members together to uniformly distribute loads.
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.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Isolate non-load-bearing steel wall framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install top of wall deflection tracks of type indicated on Drawings and anchor to building structure.
2. Connect vertical deflection clips to studs and anchor deflection clips to building structure as indicated on Drawings.
3. Connect drift clips to cold formed metal framing and anchor drift clips to building structure as indicated on Drawings.

J. Install horizontal bridging in stud system, spaced 48 inches on center maximum, fasten bridging to stud at each stud intersection. Install bridging as indicated on Drawings, or if not indicated, install one of the following:

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps, 1-1/2 by 0.0329 inch, and stud-track solid blocking of matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

K. 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.

3.5 JOIST FRAMING

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Drawings.

B. Install joists bearing on supporting framing, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Drawings.

C. Space joists not more than 2 inches from abutting walls, and as indicated on Drawings.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Drawings.

F. Install bridging at intervals indicated on Drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

A. Testing and Inspecting Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to perform tests and inspections as applicable and prepare reports.

1. Testing and Inspection Agency shall be acceptable to the Architect and the Division of the State Architect.
2. Testing and inspecting agency will report test results promptly and in writing to Architect, Division of the State Architect, and Contractor.
3. The cost of additional testing and inspecting of corrected, replaced and/or additional Work will be paid for by the Owner and the cost will be deducted from the contract sum by a change order.

B. The Architect and the Division of the State Architect shall have the right to order the testing of any materials used in the steel construction to determine if they are of the quality specified.

C. Contractor Duties and Responsibilities:

1. Contractor shall maintain control of the quality of materials and workmanship to conform to the drawings and specifications.
2. Facilitate testing and inspection as follows:

a. Schedule tests and inspections with the Testing and Inspection Agency sufficiently in advance of operations to allow for the assignment of personnel and for the completion of testing and inspecting responsibilities.
b. Provide access to the Work for the designated Testing and Inspection Agency.
c. Furnish all necessary materials and labor to assist the designated testing and inspecting agency in obtaining and handling samples at the project or other sources of materials.

3. Contractor shall correct deficiencies in the Work where tests and inspections indicate the Work does not comply with the Contract Documents.

D. Tests and Inspections:

1. The following testing and inspecting shall be performed by the designated Testing and Inspection agency.

a. Welding of Load Resisting Framing: Inspecting and testing of structural welding of load resisting framing members shall be as required by 2022 CBC Section 1705A.2.5 for projects under the jurisdiction of DSA.

1) Field and shop welds will be subject to testing and inspecting.

b. Windforce Resisting Framing: Inspecting and testing of windforce resisting framing shall be as required by 2022 CBC Section 1705A.11.2 for projects under the jurisdiction of DSA.

2. Steel Testing:

    a. Manufacturer’s mill analyses and test reports are acceptable for properly identified steel, but the enforcement agency may require additional testing to determine the quality of the steel if there is any doubt as to its acceptability. Any steel not properly identified shall be tested to meet the minimum chemical and mechanical requirements of the ASTM standard appropriate for the steel specified for the structure.
    b. Fabrication shall not commence until steel members designated on the Structural Testing and Inspection Schedule have been tested. Tests shall be made by an independent testing laboratory approved by the Architect. Reports certifying that the materials and workmanship conform to the contract documents shall be submitted to the Architect and the Division of the State Architect.

3. Shop Fabrication:

    a. Inspection of shop fabrication of all members shall be performed by an independent testing laboratory approved by the Architect.
    b. A report stating that all the materials and workmanship conform to approved drawings and specifications shall be submitted to the Architect.

4. Field Erection:

    a. Verify qualifications of field procedures and personnel.
    b. Inspect erection of cold formed steel work for conformance with the drawings and specifications.

5. Welding:

    a. All shop and field welding operations shall be inspected by a certified Welding Inspector meeting the requirements of AWS QC1 and who has been approved by the Architect. The Contractor shall schedule his operations to provide a minimum of 24 hours notice to the welding inspector so that all welding operations may be inspected.
    b. The Welding Inspector shall be an individual trained and thoroughly experienced in inspecting welding operations. The Welding Inspector's ability to distinguish between sound and unsound welding shall be reliably established.
    c. The Welding Inspector shall make a systematic record of all welds. This record shall include:

        1) Names and identification marks of welders.
        2) List of defective welds.
        3) Manner of correction of defects.

    d. The Welding Inspector shall check the material, equipment and procedure as well as the welds. He shall also check the ability of the welder.
    e. Upon detection of a rejectable weld, the inspector shall notify the Contractor, and observe removal of defects and repairs.

f. The welding inspector shall tag or stamp accepted weldments with the inspector's identification stamp

g. A report stating that the welding he is required to inspect, is proper and has been done in conformity with approved drawings and specifications shall be furnished to the Architect.

h. The Welding Inspector shall use all means necessary to determine the quality of the welds. Inspection procedures shall conform to AWS D1.3. However, the following tests and inspections shall be performed as a minimum:

1) Visual Inspection of Welding:

a) Observe multi-pass and full penetration welds continuously (i.e. the welding inspector shall be present at all times).
b) Observe single pass fillet welds periodically. The inspector shall check the qualifications of the welders at the start of the work and then make final inspection of all welds for compliance prior to completion of welding.
c) After the welding is completed, hand or power nylon brush welds, and thoroughly clean them before inspection.
d) Inspect welds with magnifiers under strong, adequate light for surface cracking, porosity, and slag inclusions; excessive roughness; unfilled craters; gas pockets; undercuts; overlaps; size; and insufficient throat and concavity.
e) Inspect the preparation of groove welds for adequate throat opening and for snug positioning of back-up bars.
f) Check the type and size of electrodes to be used for the various joints and positions. Check the storage facilities to see if they are adequate to keep the electrodes dry.
g) Verify the use of proper pre-heat and interpass temperatures.
h) Observe the technique of each welder periodically with the use of a welding inspection shield.

2) Nondestructive Testing of Welding:

a) Welds shall be non-destructive tested by one of the following methods in accordance with AWS D1.1 at the frequency noted below:

Test Method	Frequency
Liquid Dye Penetrant Testing	When requested by Architect.
Magnetic Particle Testing	10% of all fillet welds and 100% of all full penetration welds
Radiographic Testing	When requested by Architect or as substitute for magnetic particles testing or ultrasonic testing.

b) Reduced Frequency of Testing: Initially, all welds requiring 100% testing shall be tested at the rate of 100% in order to establish the qualifications of each individual welder. If the reject rate is demonstrated to be less than 5% of the welds tested for each welder, then the frequency of testing for that welder may be reduced to 25%. If the reject rate increases to 5% or more, 100% testing shall be re-established until the rate is reduced to less than 5%. The percentage of rejects shall be calculated for each welder independently. A sample of at least 40 completed welds shall be made for such reduction evaluation. Reject rate is defined as the number of welds containing rejectable defects divided by the number of welds completed. For evaluating the reject rate of continuous welds over 3 feet in length, each 12 linear inch increment of welds, one inch or less in thickness, shall be considered one weld. For evaluating the reject rate of continuous welds greater than 2 inch thickness, each 6 linear inches shall be considered one weld.

E. Remove and replace work where test results indicate that it does not comply with specified requirements.

F. Additional testing and inspecting will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer ensuring cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Pipe bollards.

B. Related Sections:

1. Division 03 Section “Post-Installed Concrete Anchors” for post installed anchors in concrete and/or masonry.
2. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
2. Shop primers.
3. Shrinkage-resisting grout.
4. Slotted channel framing.

B. Shop Drawings: For metal fabrications, include plans, elevations, sections, and details of metal fabrications and their connections; show anchorage and accessory items. Show fabrication and installation details for metal fabrications.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research Reports: For post-installed anchors.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of in-place construction contiguous with metal fabrications 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 dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

C. Schedule installation so wall attachments are made only to completed walls. Do not support metal fabrications temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg. F ambient; 180 deg F, material surfaces.

2.2 METAL PRODUCTS

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.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

1. Provide galvanized finish for exterior installations where indicated.

E. Slotted Steel Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Basis of Design: Unistrut Corporation; P1000 Channel Framing System.
2. Size of Channels: 1-5/8 by 1-5/8 inches.
3. Channel Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.108-inch (12 gage) nominal thickness.
4. Material for Fittings: Steel conforming to ASTM A 575, A 576, A 36, or A635; with finish matching channels.

F. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating, structural steel, Grade 33, unless another grade is required by design loads.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

D. Anchor Bolts and Unheaded Rods: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Post-Installed Concrete Anchors: Fabricated from corrosion-resistant materials; manufacturer, size, and type as indicated on Drawings and specified in Division 03 Section “Post-Installed Concrete Anchors.”

2.4 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 Section “Painting.”

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete: Comply with requirements in Division 03 Section "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.

2.5 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 connections, corners, and seams continuously, unless otherwise indicated, 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.
5. Cope ends of pipe or round tubing at connections to provide close fit.

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 connections that will be exposed to weather in a manner that excludes water. Provide weep holes for drainage 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 on Drawings; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as indicated on the Drawings and as needed to complete the Work.

B. Fabricate miscellaneous framing and supports from steel shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by miscellaneous framing and supports.

1. Drill, cut, and tap miscellaneous framing and supports to field bolted connections and to receive hardware, hangers, and similar items.

C. Prime miscellaneous framing and supports used at interior applications.

D. Galvanize miscellaneous framing and supports used for exterior applications or where indicated.

2.7 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.

2.8 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.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

2.9 METAL BOLLARDS

A. Fixed Bollards: Fabricate fixed metal bollards from Schedule 40 galvanized steel pipe.

1. Size: As indicated on Drawings, not less than 4 inches nominal diameter (4.5 inches actual outside diameter.

B. Removable Bollards: Fabricate removable metal bollards as indicated on Drawings from Schedule 80 steel pipe.

1. Size: As indicated on Drawings, not less than 4 inches nominal diameter (4.5 inches actual outside diameter).
2. Cap bollards with 1/4-inch thick steel plate.
3. Lift Handles: Provide removable bollards with two 1/2 inch diameter lift handles, 6 inches long and projecting 2 inches from bollard, located on opposite sides of the upper 12 inches of the bollard.
4. Collar: Provide minimum 3/8” thick collar welded to bollard at base of bollard located at grade level (Collar to bear on top of sleeve).
5. Sleeves: Fabricate sleeves for bollards from steel pipe or tubing having minimum 1/4-inch thick wall thickness, weld 1/4 inch thick steel plate to bottom of sleeve. Sleeve inside diameter shall provide 1/4 inch space around bollard (1/2 inch larger than bollard outside diameter). Depth of sleeve shall be not less than 24 inches deep or as indicated on the drawings, depth shall be 6 inches greater than embedment of bollard.
6. Provide provisions for locking bollard to sleeve with padlock (Padlock by Owner).
7. Galvanize bollard and sleeve after fabrication.

2.10 STEEL FINISHES

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

C. Galvanizing: Hot-dip galvanize exterior items and items indicated to be galvanized after fabrication to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Shop Priming: Shop prime items not to be galvanized unless they are to remain unfinished or are embedded in concrete, or masonry, or unless otherwise indicated; shop prime galvanized items that are to receive field applied top coats.

1. Preparation of Surfaces:

a. Cleaning of Galvanized Items for Shop Priming: Where galvanized items are to receive field applied top coats, prepare for priming after galvanizing by thoroughly cleaning galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

b. Surface Preparation: Prepare surfaces to comply with the following:

1) Non-Galvanized Items:

a) Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

b) Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."

2) Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

2. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing and conditions by other Specification Sections where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 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.

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.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports as indicated on Drawings and to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor support framing securely to, and rigidly brace from, building structure.

3.4 INSTALLING METAL BOLLARDS

A. Fixed Bollards Anchored in Concrete: Anchor bollards in place with concrete footings as indicated on Drawings; center and align bollards in holes 3 inches above bottom of excavation; place concrete and vibrate or tamp for consolidation; contour top surface of concrete to slope/drain away from bollard; support and brace bollards in position until concrete has cured.

1. Fill bollards solidly with concrete, mounding top surface to shed water.

B. Removable Bollards Set in Sleeves: Anchor sleeves in place with concrete footings as indicated on Drawings; center and align sleeves in holes 3 inches above bottom of excavation; place concrete and vibrate or tamp for consolidation; contour top surface of concrete to slope/drain away from sleeves; support and brace sleeves in position until concrete has cured.

3.5 REPAIRS

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. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

SECTION 055133
METAL LADDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Fixed aluminum interior roof access ladders.
2. Telescoping safety posts for ladders.

B. Related Sections include the following:

1. Division 07 Section "Roof Access Hatches" for roof access hatches.
2. Division 09 Section “Non-Structural Metal Framing” for backing support for ladder wall anchorage concealed within other construction before ladder installation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, and finishes.

B. Shop Drawings: Include plans, elevations, sections, and details of ladders and their connections. Show anchorage to adjoining Work.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal ladders 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 dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.5 COORDINATION

A. Coordinate installation of anchorages for metal ladders. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. OSHA Requirements: Comply with the following OSHA Requirements:

1. OSHA 1910.23, Ladders.
2. OSHA 1910.28, Duty to have fall protection and falling object protection.
3. OSHA 1910.29, Fall Protection Systems and falling object protection-criteria and practices.

B. ANSI: Comply with ANSI A14.3, Ladders - Fixed - Safety Requirements.

C. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.

2.2 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.

B. Ferrous Metals:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Tubing: ASTM A 500, cold-formed steel tubing.
3. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

C. Non-ferrous Metals:

1. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
2. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
3. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

4. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 ALUMINUM LADDERS

A. Basis of Design Manufacturer: Where named manufacturer products are indicated, Design, Drawings and Specifications are based on products manufactured by the following:

1. O'Keeffe's Inc.

a. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:

1) ACL Industries, Inc.
2) Alco-Lite Industrial Products.
3) Precision Ladders, LLC.

B. Interior Roof Access Ladders: O'Keeffe's Inc.; Model 500 Standard Duty Channel Rail Fixed Access Ladder.

C. Aluminum Ladders: Manufactured fixed aluminum access ladders complying with the following:

1. Siderails: Continuous extruded-aluminum channels or tubes, not less than 3 inches deep, 3/4 inch wide, and 1/8 inch thick.

a. Space siderails 18 inches apart, unless otherwise indicated.
b. Support each rail at top and bottom and not more than 60 inches on center with welded or bolted aluminum brackets.

1) Brackets shall locate the ladder such that the centerline of rungs shall not be closer than 7 inches to the finished wall surface.
2) Interior roof access ladders shall be floor and wall supported.
3) Exterior roof to roof access ladders shall be wall supported only.

c. Extend siderails at platforms to 42 inches above platforms and provide horizontal rails across platforms.

2. Rungs: Extruded-aluminum tubes, not less than 1 1/4 deep and not less than 1/8 inch thick, with ribbed tread surfaces, and capable of withstanding a 1,000 pound point load without deformation or failure.

a. Fit rungs in centerline of siderails; fasten by stainless-steel fasteners, welding, or with brackets and aluminum rivets.
b. Space rungs 12 inches on center alongside rails, 12 inches from top of roof access curb, and not more than 12 inches above the floor.

3. Finish: Mill finish.

2.4 LADDER SAFETY POST

A. Ladder-Assist Post: Ladder manufacturer's standard device for attachment to interior roof-access ladders.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: Post extends to not less than 42 inches above top rung.
3. Material: Steel tube.
4. Post: 1-5/8-inch diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat finish.
6. Location: Provide at each interior roof access ladder.

2.5 FASTENERS

A. Provide Type 304 stainless-steel fasteners for fastening aluminum ladders to in-place construction; select fasteners for type, grade, and class required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine wall framing for backing to verify actual locations before ladder installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install ladders level and plumb. Secure ladders in position with manufacturer's recommended anchoring devices.

B. 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.

3.3 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

SECTION 064116
PLASTIC LAMINATE CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate faced architectural cabinets.
2. Plastic-laminate countertops.

B. Related Sections:

1. Division 06 Section “Plastic Laminate-faced Wood Paneling” for laminate-face wood wall panels including marker/magnetic boards.
2. Division 09 Section “Non-Structural Metal Framing” for backing required for installing cabinets and concealed within other construction before cabinet installation.

1.3 SUBMITTALS

A. Product Data: For each type of product, including cabinet hardware and accessories.

1. Provide documentation VOC content for adhesives.
2. Provide documentation that wood panel products and bonding adhesives contain no urea formaldehyde.

B. 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 woodwork.
3. Apply WI-certified compliance label to first page of Shop Drawings.

C. Samples for Initial Selection:

1. Plastic laminates.
2. Phenolic resin material.
3. PVC edge material.

D. Samples for Verification:

1. Plastic Laminate and Edge Banding: One sample, 8 by 10 inches, for each type, color, pattern, and surface finish with sample applied to core material and specified edge material applied to 1 edge.
2. Composite Phenolic Resin: One sample, 8 by 10 inches, for each type, color, pattern, and surface finish with specified edge configuration applied to 1 edge.
3. Cabinet hardware, one unit for each type and finish of the following:

    a. Pulls.
    b. Hinges.
    c. Catches.
    d. Locks.
    e. Shelf supports.

E. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project, who are familiar with Woodwork Institute fabrication requirements, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Installer shall be fabricator of plastic laminate casework or fabricator shall be responsible for the Work of the installer. Installers shall be skilled workers who are experienced installing products similar to those required for this Project, who are familiar with Woodwork Institute installation requirements, and have a record of successful in-service performance.

C. Woodwork Institute (WI) Quality Assurance Program: Plastic Laminate Casework shall be subject to the following WI quality assurance program:

1. Certified Compliance Program (CCP):

    a. A WI Certified Compliance Label shall be affixed to the first page of the original shop drawing set.
    b. A WI Certified Compliance Certificate shall be issued for plastic laminate cabinets, counter tops and installation.

1.5 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 "Field Conditions" Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork 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.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements, Seismic Design: Comply with requirements of the California Building Code, Part 2, Volume 2, Chapter 16A (State Chapter) “Structural Design Requirements,” Sections 1613A.1 and 1617A, ASCE Section 7-16, Table 13.6-1, and WI construction methods for seismic design for schools and hospitals.

B. Regulatory Requirements, Accessibility: Casework shall comply with accessibility requirements of the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) 2010 ADA Standards for Accessible Design and with the 2019 California Building Code, Chapter 11B, “Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing.” Accessible casework shall comply with the following:

1. Countertop Heights for Sinks and Lavatories: Where self-rimming sinks or lavatories are installed in counter tops and the fixtures are indicated to be accessible, countertop heights shall be verified and coordinated so that the top rim of sinks and lavatories shall not be more than 34 inches above the finished floor; for self-rimming sinks, countertop heights shall be set at +33-1/2 inches above the finish floor level.

2. Knee and Toe Space at Sink Countertops (Ref. CBC 11B-306):

    a. Width: 30 inches minimum clear width.
    b. Vertical Clearance: 27 inches minimum at the front edge of countertops.
    c. Depth of Knee and Toe Clearance: Measured from the front edge of counter tops.

        1) Depth at Floor Level: 19 inches minimum / 25 inches maximum; and not less than the reach depth over the countertop.
        2) Depth at +9 Inches: Depth at floor level less 6 inches maximum (13 inches minimum depth at +9 inches for a clear space depth of 19 inches at floor level; depth increases as depth at floor level increases).
        3) Depth at +27 Inches: Depth at floor level less 9 inches maximum (10 inches minimum depth at +27 inches for a clear space depth of 19 inches at floor level; depth increases as depth at floor level increases).

3. Knee and Toe Space at Lavatory Countertops (Ref. CBC 11B-306):

    a. Width: 30 inches minimum clear width.
    b. Vertical Clearance: 29 inches minimum at the front edge of countertops.
    c. Depth of Knee and Toe Clearance: Measured from the front edge of counter tops.

        1) Depth at Floor Level: 17 inches minimum / 19 inches maximum; and not less than the reach depth over the countertop; actual depth may exceed 19 inches although it may not be considered as additional accessible toe space.
        2) Depth at +9 Inches: Depth at floor level less 6 inches maximum (11 inches minimum depth at +9 inches for a clear space depth of 17 inches at floor level; depth increases as depth at floor level increases).
        3) Depth at +27 Inches: Depth at floor level less 9 inches maximum (8 inches minimum depth at +27 inches for a clear space depth of 17 inches at floor level; depth increases as depth at floor level increases).

4. Side Reach Depth Over Countertops (Ref. CBC 11B-308.3.2): Where casework is to be accessible, casework shall be fabricated such that the side reach depth does not exceed 24 inches measured from the front edge of the countertop to the finished surface of the wall at the back of the countertop. Countertop heights shall not exceed 34 inches from the finished floor surface.

C. Quality Standard: Unless otherwise indicated, comply with Woodwork Institute's (WI) "North American Architectural Woodwork Standards" (NAAWS), latest edition, for grades of architectural plastic-laminate cabinets and counter tops indicated for construction, finishes, installation, and other requirements.

D. Seismic Design: Fabrication shall comply with referenced seismic design requirements.

2.2 PLASTIC-LAMINATE CABINETS

A. Quality Standard: Unless otherwise indicated, comply with WI's "North American Architectural Woodwork Standards," latest edition, Section 10 "Casework" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Grade: Custom.
2. Provide labels and certificates from the Woodwork Institute (WI) certification program indicating that woodwork, including installation, complies with requirements of grades specified.
3. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard indicated.

B. Fabricate casework as multiple self-supporting units rigidly joined together or as single-length sections to fit access openings.

C. Type of Construction: Type A, Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Style 1, flush overlay.

E. Laminate Cladding for Exposed Exterior and Exposed Interior Surfaces: NEMA LD 3, High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGL (1.0 mm).
2. Post-formed Surfaces: Grade HGP (1.0 mm).
3. Vertical Surfaces: Grade VGS (0.7 mm).
4. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.

F. Materials for Semi-exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
    a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
    b. For semi-exposed backs of doors and other semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS and matching color of exposed surfaces.
2. Drawer Sides and Backs: Thermoset decorative panels with PVC edge banding, 1/2 inch minimum thickness.
3. Drawer Bottoms: Thermoset decorative panels, 1/2 inch minimum thickness.

G. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL. Backs shall be 1/2 inch minimum thickness and mechanically fastened to cabinet bodies.

H. Security Dust Panels: Provide 3/4-inch thick security dust panels above lockable drawers, unless located directly under tops.

I. Shelves: Shelves shall be adjustable and supported by shelf standards and clips.

1. Design loading: 50 psf.
2. Maximum Width: 48 inches for concealed shelves, 42 inches for exposed shelves.
3. Thickness: 3/4 inch minimum.
    a. Shelves over 30 inches in width shall be 1-inch minimum thickness.

J. Hinges: Doors 80 inches or more in height shall be provided with four (4) hinges.

K. Locks, Doors and Drawers: All doors and drawers shall be provided with locks.

L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from laminate manufacturer's full range in the following categories:
    a. Solid colors, matte finish.
    b. Wood grains, matte finish.
    c. Patterns, matte finish.

2.3 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with WI's "North American Architectural Woodwork Standards," latest edition, Section 11 "Countertops" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Grade: Custom Grade.
2. Provide labels and certificates from the Woodwork Institute (WI) certification program indicating that woodwork, including installation, complies with requirements of grades specified.
3. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard indicated.

B. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS or HGP as required for post-formed countertops.

C. Colors and Pattern: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from manufacturer's full range in the following categories:
    a. Solid colors, matte finish.

D. Edge Treatment: Same as laminate cladding on horizontal surfaces.

1. Splash: Integral cove splash with square top, 4 inches high unless otherwise indicated.
2. Front Edge: Full round edge unless otherwise indicated.

    a. Square self-edge where full round edge cannot be used due to fabrication limitations, such as curves.

E. Core Material: Particleboard, 3/4 inch thick; countertops for sinks to be particleboard made with exterior glue.

F. Countertop Edge Thickness: Build up edge thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

G. Backer Sheet: Provide paper backing on underside of countertop substrate.

H. Cutouts: Edges of cut outs shall be sealed per WI Custom Grade requirements with a color toned water-resistant varnish before sink or rims are installed.

2.4 MATERIALS

A. General: Provide materials that comply with requirements of WI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Panel Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated. Provide products containing no urea formaldehyde complying with the following at Fabricator’s option:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
4. Softwood Plywood: DOC PS 1, Medium Density Overlay.

C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:

    a. Formica Corporation.
    b. Nevamar Company, LLC; Decorative Products Div.
    c. Wilsonart International; Div. of Premark International, Inc.

2. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.

2.5 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets and complying with ANSI/BHMA Grade 1 performance requirements.

B. Overlay Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch thick metal, with hospital tips; ANSI/BHMA 156.9, Grade 1.

1. Manufacturer/Product: Rockford Process Control (RCP) RP-376 or equivalent.

C. Wire Pulls: Back mounted, solid stainless steel or aluminum bent wire pulls, 4 inches long, 5/16 inch in diameter, 1-1/2 inch projection.

1. Manufacturer/Product: Doug Mockett and Company, Inc.; DP57B or equivalent.

D. Catches: Magnetic catches with aluminum body, 5 lb maximum pull load, ANSI/BHMA A156.9.

1. Manufacturer/Product: Ives, No. 325 or equivalent.

E. Drawer Slides: Ball bearing, full extension, side mounted; zinc-plated-steel ball-bearing slides ANSI/BHMA A156.9; Grade 1HD-100 and Grade 1HD-200.

1. Grade 1 HD-200, 200 lb capacity, for drawers more than 8 inches high or more than 24 inches wide.
2. Manufacturers: Accuride, Knape & Vogt, Grass, or equivalent.

F. Adjustable Shelf Standards and Supports: Steel standards and supports with zinc plated finish, ANSI/BHMA A156.9.

1. Manufacturer/Product: Knape & Vogt; No. 255 Supports with No. 256 clips.
2. Provide seismic restraint pins in back row or notch shelf.

G. Locks: Pin tumbler locks.

1. Cabinet Door Locks: ANSI/BHMA A156.11, E07121.
2. Cabinet Drawer Locks: ANSI/BHMA A156.11, E07041.
3. Manufacturer: CompX/National.
4. Keying: Confirm keying with Owner’s lock personnel.

H. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.

I. Grommets for Cable Passage through Countertops: Molded-plastic grommet with minimum 1-1/2-inch diameter cord opening with slotted cap, black.

1. Manufacturer/Product: Doug Mockett & Company, Inc.; "SG series."

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.

1. Cabinet hardware finish shall match exposed door hardware of the room in which casework is located; door hardware is specified in Division 8 Section “Door Hardware.”
2. Satin Chromium Plated: ANSI/BHMA 626 for brass or bronze base; ANSI/BHMA 652 for steel base.
3. Satin Stainless Steel: ANSI/BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.6 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Adhesives containing no urea formaldehyde and as recommended by fabricator or manufacturer. Use clear types where glue lines will be exposed.

D. VOC Limits for Installation Adhesives and Sealants: Use products 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. Multipurpose Construction Adhesives: 70 g/L.
3. Structural Wood Member Adhesive: 140 g/L.
4. Architectural Sealants: 250 g/L.

2.7 FABRICATION

A. Interior Woodwork Grade: Comply with Woodwork Institute’s (WI) “North American Architectural Woodwork Standards” (NAAWS), latest edition, quality standards indicated.

B. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

1. Accessible Casework: Comply with accessible regulatory requirements indicated in Part 2 Article “Performance Requirements.”

C. Complete fabrication, including assembly 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, 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.

E. Adjustable Shelf Standards: Adjustable shelf standards shall be recessed into cabinet sides.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and back-priming.

3.2 INSTALLATION OF CABINETS

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to walls as indicated on Drawings and in compliance with referenced seismic requirements.

F. 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.

3.3 INSTALLATION OF COUNTERTOPS

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Where applied back splashes are used, secure backsplashes to tops with concealed metal brackets at 16 inches on center and to walls with adhesive.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.4 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.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces.

END OF SECTION

SECTION 066400
FIBERGLASS REINFORECED PLASTIC PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

B. Related Sections:

1. Division 09 Section “Gypsum Board.”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated; include installation instructions; product data for panels, trim, and adhesive; and VOC content and chemical components for adhesives and sealants.

B. Samples for Initial Selection: For plastic paneling and trim accessories.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 FIBERGLASS REINFORCED PLASTIC (FRP) SHEET PANELING

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

B. Fiberglass Reinforced Plastic Panels: Plastic panels complying with ASTM D 3841 comprised of thermosetting styrenated and acrylated polyester resins reinforced with glass fibers.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kemlite Company Inc.
    b. Marlite.
    c. Nudo Products, Inc.

2. Nominal Thickness: Not less than 0.09 inch.
3. Surface Finish: Molded pebble texture.
4. Panels shall be USDA accepted for incidental food contact where installed in Lab spaces.
5. Color: As selected by Architect from manufacturer's full range of not less than six colors.
6. Surface-Burning Characteristics: Class A as determined according to ASTM E 84 by UL or another acceptable qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

2.2 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

    1. Color: Match panels.

B. Adhesive: As recommended by plastic paneling manufacturer.

    1. VOC Content: 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Division 07 Section "Joint Sealants."

    1. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove wall coverings, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

D. Condition panels and trim by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

1. Mark plumb lines on substrate at trim accessory or panel joint locations for accurate installation.
2. Locate trim accessories and panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels at locations indicated with vertical 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.

1. Install panels vertically without horizontal joints unless distance is greater than the maximum available panel length. Where horizontal joints cannot be avoided, provide H-shaped trim between panels.

C. Install panels in a full spread of adhesive.

D. Install trim accessories with adhesive and nails; do not fasten through panels.

E. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

F. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

G. Remove excess sealant and smears as panels are installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

3.4 CLEANING

A. Clean panel faces to remove soiling, stains, dust, and dirt using clean rags and cleaning agents as instructed by panel manufacturer.

END OF SECTION

SECTION 072113
THERMAL FOAM-PLASTIC BOARD ROOF INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Polyisocyanurate foam-plastic board insulation for use over roof decks.

B. Related Sections:

1. Division 07 Sections as applicable to membrane roofing systems for rigid board insulation installed as part of the roof system.
2. Division 23 Sections as applicable to air distribution duct systems for insulation for ducts.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 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.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

A. Polyisocyanurate Board, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2, Grade 2 (20 psi).

1. Manufacturers: Subject to compliance with requirements, manufacturers providing products that may be incorporated in the work include but are not limited to:

a. Atlas Roofing Corp.
b. Firestone Building Products.
c. GAF Materials Corp.
d. Johns Manville.

2. Performance and Physical Properties:

a. Panel Size: 4 feet x 8 feet.
b. Panel Thickness: As indicated on drawings, 3-inch maximum panel thickness; install in multiple layers if greater overall thickness is required for project conditions.
c. Total LTTR Value: Not less than R-5.7 per 1 inch thickness.

2.2 ACCESSORY MATERIALS

A. General: Insulation accessories recommended by insulation manufacturer for intended use and compatibility with other system components.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates designed for fastening insulation boards to substrate.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach insulation to substrate or to another insulation layer.

1. Adhesive shall have a VOC content of 50 g/L or less.

D. Insulation for Miscellaneous Voids:

1. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION

A. Coordinate installation of system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

D. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

E. 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.

3.4 INSTALLATION OF INSULATION FOR ROOFING

A. Nailer Strips: Mechanically fasten 4-inch nominal width, wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:

1. 16 feet apart for roof slopes greater than 1:12 but less than 3:12.
2. 48 inches apart for roof slopes greater than 3:12.

B. Installation Over Metal Decking:

1. Install base layer of insulation with end joints staggered not less than 12 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.

a. Locate end joints over crests of decking.
b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. Fill gaps exceeding 1/4 inch with insulation.
e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
f. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.

1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

2. Install upper layers of insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.

a. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. Fill gaps exceeding 1/4 inch with insulation.
e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
f. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
2) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.5 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, moisture, 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 072116
THERMAL AND ACOUSTICAL BATT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Glass fiber batt/blanket insulation for thermal and acoustical applications.

B. Related Sections:

1. Division 07 Section “Thermal Board Insulation” for board insulation.
2. Division 23 Sections as applicable to air distribution duct systems for insulation for ducts.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 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

2.1 GLASS-FIBER BLANKET INSULATION

A. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Guardian Fiberglass, Inc.
3. Johns Manville.
4. Knauf Fiber Glass.
5. Owens-Corning.

C. Glass-Fiber Blanket Insulation, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

D. Glass-Fiber Blanket Insulation, Reinforced-Foil-Faced: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, or foil-scrim polyethylene vapor-retarder membrane on 1 face.

E. Thermal Resistance Values and Thicknesses: Where Drawings indicate thermal resistance values, provide units of the following nominal equivalent thicknesses:

1. R-13; 3-1/2 inch thickness.
2. R-19; 6 inch thickness.
3. R-25; 8 inch thickness.
4. R-30; 10 inch thickness.
5. R-38; 12 inch thickness.

F. Roof insulation R-value shall be minimum R30. Insulation assembly shall be a double layer system consisting of two layers of insulation (3.5″ unfaced insulation blankets + 6″ faced insulation between purlins) with steel banding.

2.2 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Protect ends of spindles with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

a. Ceiling plenums.
b. Attic spaces.

C. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch minimum between face of insulation and substrate to which anchor is attached.

D. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

1. Adhesive shall have a VOC content of 50 g/L or less.

2.3 ACCESSORY MATERIALS

A. Accessory materials shall be as recommended in writing by insulation manufacturer.

B. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION

A. Install insulation in cavities formed by framing members in compliance with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation to provide a complete thermal envelope between the interior and exterior of the building and between conditioned and unconditioned interior spaces.

1. Provide insulation having thermal resistance values indicated on drawings, but not less than the following:

a. Walls: R-19.
b. Rafter Spaces and Ceilings: R-30.

2. Seal joints and fill gaps and voids in insulation using the following materials:

a. Spray Polyurethane Insulation: Seal joints and fill gaps, voids, and spaces around door and window frames with spray polyurethane insulation; apply according to manufacturer's written instructions.
b. Glass-Fiber Insulation: Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where it is not feasible to use spray polyurethane insulation; compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

C. Install insulation types according to the following:

1. Vapor-Retarder-Faced Blankets: Install vapor-retarder faced insulation at locations indicated below; install with vapor-retarder membrane to the climate conditioned side of framing.

a. Exterior Walls: Install vapor retarder faced insulation in stud wall cavities of exterior walls.
b. Interior Walls: Install vapor retarder faced insulation in stud wall cavities of interior walls between conditioned and unconditioned spaces.
c. Rafters: Install vapor retarder faced insulation in framing cavities between rafters.

2. Unfaced Blankets: Install in the following locations:

a. Interior Walls: Stud wall cavities of interior walls between conditioned interior spaces for acoustical insulation at locations indicated on the Drawings, thickness of insulation to match stud width.
b. Ceilings:

1) Thermal Applications: Install unfaced insulation over gypsum board ceilings having an unconditioned vented attic space above.
2) Acoustical Applications: Install unfaced insulation over ceilings at locations indicated on Drawings.

D. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

E. Install vapor barrier faced thermal insulation with manufacturer's R-value label exposed after insulation is installed.

F. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

G. 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.

H. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

I. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

J. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

K. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

L. Vapor Retarder Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

M. Water-Piping in Walls: 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.

N. Use mechanical anchorage to provide permanent placement and support of units.

3.4 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, moisture, 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 072616
UNDERSLAB VAPOR RETARDER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Under slab vapor retarder for concrete slabs on grade.

B. Related Sections include but are not limited to the following:

1. Division 01 Section “Photographic Documentation.”
2. Division 03 Section "Cast-in-Place Concrete."
3. Division 31 Section "Earthwork."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include manufacturer’s specifications and installation instructions.

B. Testing Documentation: Third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.

C. Samples: For vapor retarder membrane.

D. Digital Photography: Digital photographs of completed installation including seam and penetration sealing, terminations at foundations, and repairs.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the vapor retarder.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Review procedures for field quality control, vapor-barrier installation, steel reinforcement installation, repair procedures, and protection.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened packaging, with labels identifying manufacturer and product.

B. Store materials in accordance with manufacturer's written instructions and to prevent damage.

C. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Do not apply material during rain or during windy conditions.

B. Do not apply on frozen ground.

1.7 COORDINATION

A. Coordinate installation of vapor retarder, reinforcing steel, and placement of concrete to minimize tears and punctures, and to minimize exposure of vapor retarder to sunlight.

PART 2 - PRODUCTS

2.1 VAPOR RETARDERS

A. Plastic Vapor Retarder: Single ply membrane extruded from virgin grade high-impact polyolefin complying with ASTM E 1745, Class A.

1. Available Products: Subject to compliance with requirements, provide one of the following products:
    a. Raven Industries Inc.; Vapor Block 15.
    b. Stego Industries, LLC; Stego Wrap 15 mil.
    c. W.R. Meadows, Inc., Perminator 15.
2. Thickness: 15 mils.
3. Roll Width: 12 feet minimum.
4. Maximum Permeance: One of the following: ASTM E1745 Section 7.1 (7.1.1-7.1.5), permeance of less than 0.01 Perms (grains/(ft2 · hr · inHg)) after conditioning.
5. Puncture Resistance: ASTM D1709, Method B, not less than 2,266 Grams.

2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by manufacturer for intended use and compatible with vapor retarder.

B. Seam Tape: High Density Polyethylene Tape with pressure sensitive adhesive as manufactured or recommended by vapor retarder manufacturer, minimum width 4 inches.

C. Pipe Boots: Construct pipe boots from vapor retarder material and pressure sensitive tape per manufacturer's written installation instructions.

D. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions with Installer present for compliance with requirements for conditions affecting performance of the Work.

B. Proceed with installation of vapor retarder only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Level and tamp or roll granular base as specified in Division 31 Section "Earthwork."

3.3 INSTALLATION OF VAPOR RETARDER

A. Vapor Retarders: Place, protect, and repair vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Vapor retarder to be installed over prepared, finely graded subgrade.

B. Unroll vapor retarder and install with the longest dimension parallel with the direction of the pour. Open all folds to the full width.

C. Lap joints 6 inches and seal with manufacturer's recommended tape.

D. Seal holes, openings, and pipe and conduit penetrations in vapor retarder. Fabricate boots around pipes and conduits in accordance with manufacturer's written installation instructions and seal with tape.

E. Areas of adhesion for taped seams, penetrations, and repairs shall be free of dust, dirt, moisture, or other conditions affecting the performance of the tape seal.

F. Terminate vapor retarder at vertical foundation walls by turning up 4 inches against the wall and sealing with tape or fastening with concrete nails spaced 4 feet on center. Where vertical foundation walls do not occur, extend vapor retarder not less than 12 inches into footing trench prior to pouring footings.

G. Do not place a blotter layer (i.e., sand) between the vapor barrier and slab unless approved in advance by the Architect and Geotechnical Engineer and all mitigation measures contained in the Geotechnical Report are followed.

H. Coordinate installation of vapor retarder with Work Division 3 Section “Cast-in-Place Concrete.”

1. Use only brick type reinforcing bar supports for reinforcing steel.
2. Avoid driving stakes through vapor retarder membrane, repair all holes.
3. Provide for protection of vapor retarder membrane in high traffic areas.

3.4 FIELD QUALITY CONTROL

A. Immediately after the installation of the vapor retarder, the Contractor, in the presence of the Owner’s Inspector or representative, shall review the completed installation and document the installation using digital photography. Documentation shall include the completed installation, seams, penetrations, terminations, and repairs.

B. After installation of reinforcing steel and just prior to pouring of concrete, the Contractor, in the presence of the Owner’s Inspector or representative, shall review the installed vapor retarder for tears or damage.

C. Inspection reports shall be submitted to the Architect and the Contractor.

3.5 REPAIRS

A. Repair tears and punctures with a vapor retarder patch that overlaps the damaged area by 6 inches in all directions, seal perimeter of the patch with tape.

3.6 PROTECTION

A. Protect installed vapor retarders from damage due to UV light, harmful weather exposures, physical abuse, and other causes until concealed by permanent construction.

B. Remove rain or water from retarder prior to concrete placement by air blowers.

END OF SECTION

SECTION 074213
FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exposed fastener, lap seam metal wall panels including associated trim and flashings.
2. Concealed fastener lap seam metal wall panels including associated trim and flashings.

    a. Products Specified in Other Sections: Where project conditions include metal wall and/or soffit panels, all panel types shall be manufactured by one manufacturer, and the installation of all panel types shall be under the responsibility of one installing entity.

B. Related Sections:

1. Division 07 Section "Metal Soffit Panels" for soffit panels.
2. Division 07 Section "Sheet Metal Flashing and Trim" for additional requirements for sheet metal flashing and trim.
3. Division 07 Section "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory and field-assembled work.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Wall Panels: 8-inch square sample for each color selected on same material of panels.

E. Qualification Data: For Installer.

F. Field quality-control reports.

G. Warranties: Samples of special warranties.

H. Maintenance Data: For metal panels to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by panel manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical area including trim, flashing, and accessories as directed by Architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Meet with Owner, Owner’s Inspector of Record, Architect, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of accessories.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review loading limitations of supporting structure.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.

7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal panel work to be performed according to manufacturer's written instructions and warranty requirements.

1.8 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty, Materials and Workmanship, and Finishes: A single warranty, or warranty from a single entity, shall be provided for steel substrate material, Zincalume base, and factory finishing. Warranties shall apply to, but not be limited to, panels, flashing, and trim.

1. Special Warranty, Material and Workmanship: Manufacturer's standard form in which manufacturer agrees to repair or replace metal panel systems that fail in materials or workmanship within specified warranty period.

a. Failures include, but are not limited to, the following:

1) Structural failures including rupturing, cracking, or puncturing.
2) Deterioration of metals, metal finishes, and other materials beyond normal weathering.

b. Warranty Period: 2 years from date of Substantial Completion.

2. Special Warranty, Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period. Warranty shall include finishes for exposed fasteners.

a. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

1) Color fading more than 5 Hunter units when tested according to ASTM D 2244.
2) Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.

b. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Metal Wall Panels over Outside-Insulated Framed Wall System: Single-skin exposed fastener metal wall panels applied as exterior rainscreen cladding over wall framing specified in Division 05 Section "Cold-Formed Metal Framing" with exterior sheathing specified in Division 06 Section "Sheathing", an applied membrane that provides air, moisture, and water vapor control specified in Division 07 Section "Air Barriers", insulation within the framing and rigid insulation applied outboard of the sheathing specified in Division 07 Section "Thermal Insulation." Metal wall panel installation specified in this Section includes secondary metal sub-girt framing for panel attachment.

B. Metal Wall Panels over Uninsulated Framed (Screen) Wall System: Single-skin exposed fastener metal wall panels applied as exterior barrier cladding over wall framing specified in Division 05 Section "Cold-Formed Metal Framing". Metal wall panel installation specified in this Section may include secondary metal sub-girt framing for panel attachment.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

B. Air Infiltration, Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of area when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft., positive pressure.

C. Water Penetration, Wall Panels: No uncontrolled water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.4 lbf/sq. ft., positive pressure.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.3 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners at side laps. Include accessories required for weathertight installation.

2.4 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by installing horizontally and lapping interlocking top and bottom edges of adjacent panels and mechanically attaching panels to supports using concealed fasteners and factory applied sealant. Include accessories required for weathertight installation.

B. Tapered-Rib-Profile, Concealed-Fastener Metal Wall Panels: Formed with raised, trapezoidal ribs equally spaced across panel.

1. Basis-of-Design Product: Drawings and specifications are based on the following:
   a. AEP Span, A division of ASC Profiles Inc.; Perception Series
      1) Subject to compliance with requirements, provide product indicated or a comparable product by one of the following:
         a) AEP Span, a Division of ASC Profiles, Inc.
         b) CENTRIA Architectural Systems.
         c) MBCI, a division of NCI Building Systems.
         d) McElroy Metal, Inc.
         e) Taylor Metal Products

2. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Pre-painted by the coil-coating process to comply with ASTM A755/A755M.

    a. Nominal Thickness: 0.022 inch (24 gauge).
    b. Exterior Finish: Two-coat fluoropolymer.

        1) Color: As indicated on Drawings.

    c. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

3. Panel Profile:

    a. Panel Coverage: 12 inches nominal.
    b. Panel Height: 1-3/8 inches.
    c. Surface Texture: Smooth.
    d. Design: Three equally spaced ribs with tapered edges, 1-1/2” face dimension spaced 4 inches on center.

C. Clip Installation System: Manufacturer’s standard flush clip installation system with clips having pre-drilled attachment holes at one end and panel hook at other end, sized to fit panels; 18 gauge (.0438 Min.), 40ksi yield min., G90 galvanized, material in conformance with ASTM A-653 Class G90.

2.5 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fascia, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
4. Furring Strip Shims: Neoprene/EPDM, self-adhering shim pads for horizontal furring to maintain drainage plane continuity at weather barrier membrane.

    a. Basis of Design Product: VaproShim SA or approved equal. Size: 1 inch wide x 4 inches long. Provide 1/8 inch thickness except where ¼ inch is indicated or rquired.

C. Flashing and Trim: Flashing and trim formed from same material and thickness as panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Exposed Fasteners: Provide exposed fasteners by panel manufacturer with heads finished to match color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

E. Panel Sealants: Provide sealant type recommended by panel manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.

1. 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.
2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.6 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. End Seams for Coil Coated Finished Material: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3. End Seams for Field Finished Material: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal panel manufacturer for application, but not less than thickness of metal being secured.

2.7 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a 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 the range of approved Samples. Noticeable variations in same piece are unacceptable. 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. Steel Panels and Accessories:

1. Exposed Surfaces: Two-coat fluoropolymer AAMA 621 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.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall insulation to verify that insulation board joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before metal panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Commence metal wall panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
4. Install screw fasteners in predrilled holes.
5. Locate and space fastenings in uniform vertical and horizontal alignment.
6. Install flashing and trim as metal wall panel work proceeds.
7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

E. Lap-Seam Metal Wall Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

F. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

3.4 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges

folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. 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 weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

C. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 074643
COMPOSITION SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Composition siding for fencing and miscellaneous exterior cladding.
2. Finishing accessories and trim.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for metal stud substrate support framing.
2. Section 079200 "Joint Sealants" for sealants at edges and transitions between composite composition siding system and exterior cladding.

1.2 COORDINATION

A. Coordinate composition siding installation with flashings, trim, and construction of other adjoining work to ensure proper sequencing and to provide a leakproof, secure, and non-corrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product and component included in composition siding system.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product and accessory included in assembly system.

B. Samples for Verification: For each type, color, texture, and pattern required.

1. Four-inch- (100-mm-) long by 6-inch- (150-mm-) wide sample of siding.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, tests performed by a qualified testing agency.

B. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver assembly system components and other manufactured items so as not to be damaged or deformed. Package assembly system components for protection during transportation and handling with manufacturer's name and identification of products.

B. Unload, store, and erect assembly system components in a manner to prevent bending, warping, twisting, and surface damage.

C. Store assembly system components on platforms or pallets, covered with suitable weathertight and ventilated covering.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of composition siding system to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of composition siding system against manufacturing defects, as well as staining and color fade, within specified warranty period.

1. Manufacturing defects include, but are not limited to, checks, splinters, delamination, and damage from rot and fungal decay.
2. Color Fade: Color change from light and weathering exposure not to exceed 5 Delta E (Hunter) units.
3. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Provide components and materials specified in this Section from single manufacturer for a complete and compatible assembly.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide composition siding system tested in accordance with ASTM E330/E330M and certified to be without permanent deformation or failure of structural members in accordance with design wind velocities for Project geographic location and probability of occurrence based on data from wind velocity maps provided in ASCE 7 and as approved by authorities having jurisdiction (AHJ).

1. Design Loads: As indicated on Drawings.
2. Wind-Borne Debris Impact Resistance: Cladding assembly tested in accordance with TAS 201, TAS 202, and TAS 203 for High Velocity Hurricane Zone (HVHZ)

applications, by an accredited testing laboratory. Passes the specified TAS Test Protocols for large missile impact.

B. Fire-Resistance Performance: Comply with ASTM E119 for testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency acceptable to AHJ.

1. Surface-Burning Characteristics: Provide composition siding system with a flame-spread index of 75 or less and a smoke-developed index of 200 or less when tested in accordance with ASTM E84 and UL 723.
2. Self-Ignition Temperature: Not less than 883.9 deg F (473.3 deg C) when tested in accordance with ASTM D1929.
3. Flash-Ignition Temperature: Not less than 754.5 deg F (401.4 deg C) when tested in accordance with ASTM D1929.

C. Thermal Movement Performance: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.

1. Coefficient of Thermal Expansion: 1.9 x 10-5 in/in/deg F when tested in accordance with ASTM D6341.
2. Modulus of Elasticity: 338,000 psi when tested in accordance with ASTM D6109.
3. Modulus of Rupture: 4,970 psi when tested in accordance with ASTM D6109.
4. Creep Recovery: 84 percent average recovery with maximum unrecovered deflection not to exceed 1/16 inch for 151 lb. test load when tested in accordance with ASTM D7032.

D. Exposure Performance:

1. UV Resistance: Successfully passed after 2000 hours of Xenon-Arc exposure when tested in accordance with ASTM D2565, Cycle 1.
2. Fungus Decay Resistance: No significant decay; AWPA E10.
3. Termite Resistance: Passes; AWPA E1.
4. Delamination - Submersion Test: No delamination after 30 days when tested fully submerged in water at 70 deg F and 150 deg F.
5. Delamination - High Heat and Humidity Test: No delamination after 30 days suspended directly above, but not immersed into, 150 deg F water.
6. Delamination - Soak/Freeze/Thaw Test: No delamination after 50 soak/freeze/thaw cycles. Soak in room temperature water, freeze for a minimum four hours, thaw, and repeat.

2.3 COMPOSITION SIDING

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:
1. Fiberon LLC; 300 Wildwood Composite Cladding System, or an equivalent product by one of the following:

a. Azek Building Products.
b. Longboard Products.
c. Trespa.

d. Trex Company, Inc.

B. Coextruded wood-plastic composite (WPC) core boards complying with ASTM D7031 and the following:

1. Thickness: 0.75 inch (19 mm) total thickness, including 0.02-inch- (0.5-mm-) thick capping material.
2. Width: As indicated on Drawings with 1/8inch- (3-mm) diameter eased edges.
3. Length:12 ft. (3.6 m).
4. Color: As indicated on Drawings.

C. Finishing Accessories and Trim: Provide [manufacturer's standard] [fabricated] trim, angles, and similar components at corners, transitions, and rough openings meeting the performance requirements. Finish to match cladding system.

D. Fasteners: Type [304] [316] stainless steel self-tapping screws, minimum #9, complying with ASTM C1002 as recommended in writing by composite siding system manufacturer suitable for and compatible with system materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, composition siding system supports, and other conditions affecting performance of the Work.

1. Examine framing to verify that support members and anchorage have been installed within alignment tolerances required by composition siding manufacturer.

B. Examine roughing-in for components and systems penetrating composition siding system to verify actual locations of penetrations relative to seam locations of fabricated wall panel assemblies before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate surfaces thoroughly prior to installation. Prepare substrate surfaces using methods recommended in writing by cladding support system manufacturer.

B. Prepare sub-framing and provide anchorage for substrate type and exterior cladding type in accordance with cladding support system manufacturer's written instructions.

3.3 INSTALLATION

A. General: Install composition siding with open joints in accordance with manufacturer's written instructions in orientation, sizes, and locations indicated. Anchor composition siding and other components of the Work securely in place.

1. Shim or otherwise plumb substrates receiving composition siding system.
2. Locate and space fastenings in uniform vertical and horizontal alignment.
3. Install trim as composition siding work proceeds.
4. Align bottoms of composition siding.

B. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by fabricated wall panel manufacturer.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed trim. Space movement joints at a maximum of 10 ft. (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

A. On completion of composition siding system installation, clean finished surfaces as recommended by manufacturer. Maintain in a clean condition during construction.

B. Replace composition siding system components that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manufactured Sheet Metal Flashing Products:
    a. Manufactured reglets and counter flashing.
2. Formed sheet metal fabrications:
    a. Flashing and trim.
    b. Copings.
    c. Miscellaneous sheet metal fabrications.

B. Related Sections include the following:

1. Division 06 Section “Rough Carpentry” for wood nailers, curbs, and blocking.
2. Division 07 Sections as applicable to metal wall and soffit panels for sheet metal flashing and trim integral with metal panel systems.
3. Division 07 Sections as applicable to roofing for sheet metal flashing and trim integral with roofing systems.
4. Division 07 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.
5. Division 07 Section “Expansion Control” for interior and exterior seismic building joint covers.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For fabricated sheet metal items. Show fabrication and installation layouts 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 expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish; submit 12-inch-long sample of fabricated unit including finished seam, fasteners, cleats, clips, closures, and other attachments.

E. Qualification Data: For fabricator.

F. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.

G. Sample Warranty: For special warranty.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Entity 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.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge including built-in gutter, approximately 10 feet long, including supporting construction cleats, seams, attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim.
2. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
4. Review requirements for insurance and certificates if applicable.
5. Review sheet metal flashing observation and repair procedures after flashing installation.

1.7 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.

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.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Finish: Deterioration includes, but is not limited to, the following:
    a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies 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. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The Roofing and Waterproofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements as applicable for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressures:

1. Horizontal Outward Pressure: 24 psf.
2. Vertical Upward Pressure: 75 psf.

D. Thermal Movements: Sheet metal flashing and trim shall allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2. Coil-Coated Finishes:

a. Exposed Coil-Coated Finish: Three-coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1) Color: As selected by Architect from manufacturer's full range.

b. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; pre-painted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, flat and mill phosphatized for field painting

2. Coil-Coated Finish:

a. Exposed Coil-Coated Finish: Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1) Color: As selected by Architect from manufacturer's full range.

b. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil thick polyethylene sheet complying with ASTM D 4397.

B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.

C. Self-Adhering, High-Temperature Sheet: Minimum 30 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 D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
3. Products: Subject to compliance with requirements, provide one of 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.

2.4 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. Self-drilling screws, gasketed, with hex-washer head.
2. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
4. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder for Zinc-Coated (Galvanized) Steel: ASTM B 32, 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 C 920, elastomeric polyurethane, polysulfide, or 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. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior non-moving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and welded corners and junctions.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Fry Reglet Corporation.
    b. Heckmann Building Products Inc.
    c. Hickman, W. P. Company.

2. Material: Galvanized steel, 0.0217 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers and with channel for sealant at top edge.
4. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
5. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
7. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
8. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim as indicated on Drawings and 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 nonexpansion 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 and of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams and as follows:

1. Seams for Pre-Finished Metal: Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
2. Seams for Unfinished Sheet Steel: Tin edges to be seamed, form seams, and solder.
3. Seams for Unfinished Aluminum: Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

G. Do not use graphite pencils to mark metal surfaces.

H. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

2.7 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in continuous sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.

1. Expansion Joints: Butt type with cover plate. Space expansion joints not more than 40 feet on center.
2. Accessories: Wire ball downspout strainer].
3. Gutters: Fabricate from 0.028 inch (24 gage) thick aluminum-zinc alloy-coated steel.

B. Downspouts: Fabricate downspouts of size and profile indicated on Drawings complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors. Fabricate from same material and thickness as gutters. Coordinate termination transition fitting with in-wall piping.

C. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from 0.028 inch (24 gage) thick galvanized steel.

D. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes**,** exterior flange trim, and built-in overflows. Fabricate from 0.028 inch (24 gage) thick galvanized steel.

E. Splash Pans: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing and Fascia Caps: Fabricate in minimum 96-inch long, but not exceeding 10 foot long, sections. Furnish with 6-inch wide joint cover plates. Fabricate from 0.028 inch (24 gage) thick galvanized steel.

1. Joint Style: Lap, 4 inches wide.

B. Copings: Fabricate to cross section indicated in minimum 96-inch long, but not exceeding 10 foot long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight. Fabricate from 0.028 inch (24 gage) thick galvanized steel.

1. Joint Style: Butt, with 12-inch wide, concealed backup plate and 6-inch wide, exposed cover plates

C. Counterflashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

D. Roof-Penetration Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

E. Roof-Drain Flashing: Fabricate from zinc-tin alloy-coated stainless steel, 0.015 inch thick.

2.9 WALL SHEET METAL FABRICATIONS

A. Wall Flashing: Fabricate continuous flashings in minimum 96-inch long, but not exceeding 12 foot long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch high end dams. Fabricate from 0.028 inch (24 gage) thick galvanized steel.

2.10 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Miscellaneous Sheet Metal Fabrications: Fabricate from 0.028 inch (24 gage) thick galvanized steel unless otherwise indicated.

2.11 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of 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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

C. 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.

3.3 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.
7. Do not use graphite pencils to mark metal surfaces.

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 uncoated aluminum 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 corners or intersections. 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:

1. Wood Framing, Blocking, and Sheathing: 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.
2. Metal Framing, Backing, and Decking: Use fasteners of sizes that will penetrate metal framing, backing, and decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

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. When ambient temperature at time of installation is moderate, between 40 and 70

deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "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 solder coil-coated steel and aluminum sheet.
2. 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.

G. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.4 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.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets or straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant.

1. Fasten gutter spacers to front and back of gutter.
2. Loosely lock straps to front gutter bead and anchor to roof deck.
3. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
5. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches on center in between.

1. Connect downspouts to underground drainage system where indicated.

D. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with roofing membrane.

E. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
2. Loosely lock front edge of scupper with conductor head.
3. Seal or solder exterior wall scupper flanges into back of conductor head.

F. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper discharge.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, SMACNA's "Architectural Sheet Metal Manual," and NRCA's Roofing and Waterproofing Manuals as applicable to project conditions 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 referenced requirements and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 16 inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes 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.

3.6 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. Reglets and Counterflashing: Install in accordance with manufacturer's written installation instructions.

C. Openings Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings, unless shown otherwise on the drawings.

3.7 MISCELLANEOUS FLASHING INSTALLATION

A. 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.

3.8 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.

3.9 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. 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 077233
ROOF HATCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof hatches.
2. Roof hatch guardrails.

B. Related Sections:

1. Division 05 Section "Metal Ladders" for vertical ladders for access to roof hatches and telescoping safety posts for ladders.
2. Division 07 Sections as applicable to roofing systems.

1.3 SUBMITTALS

A. Product Data: For roof hatch and guardrail system. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof hatches and guardrail system; include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions.

C. Operation and Maintenance Data: For roof hatch and guardrail system to include in operation and maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of roof hatches with roof framing, roofing system, flashing, and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS, GENERAL

A. General Performance: Roof hatches and guardrail systems shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF HATCHES

A. Roof Hatches: Metal roof-hatch units with lids and insulated single-walled curbs with welded corners, continuous lid-to-curb counterflashing, weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Babcock-Davis.
   b. Bilco Company (The).
   c. Dur-Red Products.
   d. J. L. Industries, Inc.
   e. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
   f. Nystrom.

2. Type and Size: Single-leaf lid, 30 by 36 inches.
3. Type and Size: Single-leaf lid, 36 by 60 inches.
4. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
5. Hatch Material: Zinc-coated (galvanized) steel sheet, 0.079 inch (14 gage) thick.

   a. Finish: Baked enamel or powder coat finish.
   b. Color: As selected by Architect from manufacturer's full range.

6. Construction:

   a. Curb Insulation: 1 inch thick cellulosic fiber board.
   b. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
   c. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
   d. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

7. Hardware: Spring operators, hold open arm, galvanized steel spring latch with turn handles, galvanized or stainless steel butt or pintle-type hinge system, and padlock hasps inside and outside.

2.3 ROOF HATCH SAFETY RAILING SYSTEM

A. Performance Requirements: Comply with 29 CFR 1910.23 requirements and authorities having jurisdiction including CAL-OSHA.

B. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; and attached to roof hatch.

1. Height: 42 inches minimum above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
3. Maximum Opening Size between Rails: System constructed to prevent passage of a sphere 21 inches in diameter.
4. Gate: Self-closing and self-latching gate fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
5. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
7. Fabricate joints exposed to weather to be watertight.
8. Fasteners: Manufacturer's standard, finished to match railing system.
9. Finish: Manufacturer's standard.

2.4 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

1. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

B. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

C. Steel Tube: ASTM A 500, round tube.

D. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

E. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.5 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.

C. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.

D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Underlayment:

1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

G. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

I. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

J. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

K. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof hatches and accessories according to manufacturer's written instructions.

1. Install roof hatches and accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof hatches and accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation and fit them to substrates.
4. Install roof hatches and accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing roof accessories 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.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof-Hatch Installation:

1. Install roof hatch so top surface of hatch curb is level.
2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.

D. Safety Railing Installation: Attach safety railing system to roof-hatch curb.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean bolted connections and abraded areas, and repair galvanizing according to ASTM A 780.

B. Touch up factory-finished surfaces with compatible finish.

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace items that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants including mildew resistant silicone joint sealants
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.
5. Joint sealant Backings

B. Related Sections:

1. Division 07 Section "Expansion Control" for building expansion joint covers.
2. Division 32 Section “Concrete Paving Joint Sealants” for exterior concrete paving joint sealants.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product, include documentation for VOC content of sealants and sealant primers.

B. 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.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

E. Field-Adhesion Test Reports: For each sealant application tested.

F. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity employing installers trained and experienced in installing joint sealants similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

C. 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.

1.5 FIELD 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.
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.

1.6 WARRANTY

A. Special Installer's Warranty: 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 Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties shall warrant that all exposed sealants will be guaranteed against any crazing developing on the surfaces of the material, any staining of adjacent surfaces by sealant or by primer (yellowing, etc.), chalking, or color changes on surface of cured sealant.

D. 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 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

2.1 JOINT SEALANTS, 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: Sealants and primers applied at the Project site shall comply with VOC limits of authorities having jurisdiction; VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); and VOC limits of the California Green Building Standards Code (CGBSC), Section 5.504.4.1 and Table 504.4.2 as follows:

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

D. Stain-Test-Response Characteristics: Where sealants are indicated to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are used in areas of food preparation, use products that comply with 21 CFR 177.2600 and are USDA approved.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

G. Source Limitations: Obtain each kind of joint sealant from a single source from a single manufacturer.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, non-sag, plus 100 percent and minus 50 percent movement capability, non-traffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT. neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; 790.
    b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    c. Tremco Incorporated; Spectrem 1.

2. Joint Sealant Application: Exterior joints where one or both joint faces are masonry, stone, concrete or other porous materials and are not to be painted.

B. Silicone, Acid Curing, S, NS, 25, NT: Single-component, non-sag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; 999-A.
    b. GE Advanced Materials - Silicones; Contractors SCS1000.
    c. Tremco Incorporated; Proglaze.

2. Joint Sealant Application: Exterior joints where both joint faces are metal, glass, plastic, or other non-porous material and are not to be painted.

C. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, non-sag, plus 25 percent and minus 25 percent movement capability, non-traffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT; formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; 786 Mildew Resistant.
    b. GE Advanced Materials - Silicones; Sanitary SCS1700.
    c. Tremco Incorporated; Tremsil 200 Sanitary.

2. Joint Sealant Application: Interior joints between plumbing fixtures and floor or wall surfaces of non-porous materials and are not to be painted.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, non-sag, non-traffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. BASF Building Systems; Sonolastic NP1.
    b. Pecora Corporation; Dynatrol I-XL.
    c. Sika Corporation, Construction Products Division; Sikaflex - 1a.

2. Joint Sealant Application: Exterior joints of hollow metal frames, exterior joints in concrete and masonry walls, and interior and exterior joints requiring painting.

B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and non-traffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. BASF Building Systems; Sonolastic SL 1.
    b. Pecora Corporation; Urexpan NR-201.
    c. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.

2. Joint Sealant Application: Interior concrete slab floor joints and exterior paving joints.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. BASF Building Systems; Sonolac.
    b. Pecora Corporation; AC-20+.
    c. Tremco Incorporated; Tremflex 834.

2. Joint Sealant Application: Interior non-moving joints between gypsum board and adjacent materials, trim, or similar surfaces.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex acoustical sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. GE Construction Sealants; RCS20 Acoustical.
    b. Pecora Corporation; AC-20 FTR or AIS-919.
    c. Tremco, Incorporated; Tremco Acoustical Sealant.
    d. USG Corporation; SHEETROCK Acoustical Sealant.

2. Joint Sealant Application: Interior joints of acoustically rated construction and where indicated on Drawings.

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; 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 C 1330, Type C (closed-cell material with a surface skin) or Type B (bicellular material with a surface skin), 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 joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

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

3.1 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.

3.2 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 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.
    d. Exterior insulation and finish systems.

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. Etch concrete and masonry joint surfaces as recommended by manufacturer to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5% solution of muriatic acid; neutralize with diluted ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

C. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer. 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.

D. 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.

3.3 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 C 1193 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.

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. Install sealant to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of bead:

1. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75 percent of joint width, but neither more than 5/8 inch deep nor less than 3/8 inch deep.
2. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but neither more than 1/2 inch deep nor less than 1/4 inch deep.
3. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in range of 75 to 125 percent of joint width.

G. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces.

H. 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 C 1193, unless otherwise indicated.

3.4 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. General: Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.5 FIELD QUALITY CONTROL

A. General: Provide field adhesion testing when required by manufacturer and/or installer for warranties required of manufacturer and/or installer.

B. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
    a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
    b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:
    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

C. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or non-compliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.6 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.

3.7 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.

END OF SECTION

SECTION 081053
DOOR LOUVER AND LITE FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Door lite frames for hollow metal and wood doors.
2. Door louvers and frames for hollow metal and wood doors.

B. Related Sections:

1. Division 08 Sections "Hollow Metal Doors and Frames" for hollow metal doors.
2. Division 08 Sections "Flush Wood Doors" for wood doors.
3. Division 08 Section "Glazing" for glass installed in door lite frames.
4. Division 09 Sections “Painting” for field painting louvers and door lite frames.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, and finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain door lite frames and door louvers from a single source from a single manufacturer.

B. Basis of Design Manufacturer: In other Part 2 Articles where products are identified by Basis of Design named manufacturer and product, products are based on items manufactured by:

1. Anemostat Door Products.
    a. Subject to compliance with requirements, provide products indicated, or comparable products by one of the following:
        1) Activar Construction Products Group.
        2) Alternate manufacturer subject to request for substitution.

2.2 DOOR LITE FRAMES

A. Metal Frames for Light Openings in Doors: Manufacturer's standard frame formed of steel sheet; factory primed for field finishing.

1. Basis of Design: Anemostat Door Products, LoPro or LoPro-IS Series as required for glass thickness specified.
2. Physical Characteristics:
    a. Frame Material: 0.033 inch thick (20 gage) steel of material as follows:
        1) Interior Door Lite Frames: Cold rolled steel of thickness indicated.
        2) Exterior Door Lite Frames: Hot dipped galvanized of thickness indicated.
    b. Size: As indicated on Drawings.
    c. Glazing Thickness: As indicated on Drawings.
    d. Finish: Baked enamel.
    e. Fasteners: Oval head Phillips wood or sheet metal screws.
        1) Provide one-way vandal resistant oval head wood or sheet metal screws at exterior doors.

2.3 DOOR LOUVERS

A. Standard Louvers: Manufacturer's standard louver with frame formed of steel sheet; factory primed for field finishing.

1. Basis of Design: Anemostat Door Products, FDLS Series non-vision inverted split ‘Y’ louver.
2. Physical Characteristics:
    a. Material:
        1) Interior Door Louvers: Cold rolled steel of thickness indicated.
        2) Exterior Door Louvers: Hot dipped galvanized of thickness indicated.
    b. Frame and Louver Blades: 0.042 inch thick (18 gage) steel.
    c. Size: As indicated on Drawings.
    d. Free Ventilating Area: 50%.
    e. Finish: Baked enamel.
    f. Insect Screens: Provide galvanized insect screens for exterior door louvers installed between split louvers.
    g. Fasteners: Oval head Phillips wood or sheet metal screws.
        1) One-way vandal resistant oval head wood or sheet metal screws at exterior doors.

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy coating designation.

D. Glazing: Comply with requirements in Division 8 Section "Glazing."

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install door louvers, louver frames, and lite frames in accordance with manufacturer's written instructions.

1. At fire-protection-rated door lite openings, install frames according to NFPA 80.

B. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with manufacturer's written instructions.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Hollow-metal frames.
2. Hollow-metal doors.

B. Related Sections:

1. Division 08 Section “Door Louver and Light Frames” for door light frames.
2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
3. Division 08 Section "Door Hardware" for testing of fire rated door installations egress doors with panic hardware and/or electrified hardware.
4. Division 08 Section "Glazing" for glass installed in hollow metal doors and frames.
5. Division 09 Sections “Painting” for field painting hollow metal doors and frames.
6. Division 26 Sections as applicable for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.

7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work vertically under cover at Project site with head up. Place on minimum 4 inch high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of 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.

1.7 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. 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. Deliver such items to Project site in time for installation.

B. Coordinate requirements for preparation and installation of electrified door hardware and access control and security systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Deansteel Manufacturing Company, Inc.
5. Metal Products Incorporated (MPI).
6. Steelcraft; an Ingersoll-Rand company.
7. Windsor Republic Doors.

B. Source Limitations: Obtain hollow metal work from a single source from a single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.3 HOLLOW METAL DOORS

A. General: Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

1. Type/Design: Flush panel unless otherwise indicated on the Drawings.
2. Door Thickness: 1-3/4 inches unless otherwise indicated.
3. Vertical Edges for Single-Acting Doors: Beveled, 1/8 inch in 2 inches.
4. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
5. Openings: Factory cut openings in doors.
6. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
7. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
8. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
9. Exposed Finish: Factory prime finish for field painting.

B. Exterior Doors: Doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level.

1. Extra Heavy Duty Doors, Level 3 and Physical Performance Level A.

2. Edge Condition: Model 1, full flush.
3. Face Sheet Material: Fabricated from metallic-coated steel sheet, 0.053-inch minimum thickness (16 gage).
4. Core Construction: One of the following:

a. Manufacturer's standard polyurethane, or polyisocyanurate core.

b. Manufacturer’s standard as required to comply with fire-protection and temperature-rise ratings indicated.

5. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints in top edges of doors against water penetration.
6. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.

C. Interior Doors: Doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level.

1. Heavy Duty Doors, Level 2 and Physical Performance Level B.

2. Edge Condition: Model 1, full flush.
3. Face Sheet Material: Fabricated from cold-rolled steel sheet, 0.042-inch minimum thickness (18 gage).
4. Core Construction: One of the following:

a. Manufacturer's standard polyurethane, or polyisocyanurate core.
b. Kraft paper honeycomb core; one inch cell, phenolic resin impregnated core, laminated to face sheets, full area.
c. Manufacturer’s standard as required to comply with fire-protection and temperature-rise ratings indicated.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

1. Fabricate frames with mitered or coped full profile welded corners unless otherwise indicated.
2. Frames shall be sized to provide full throat width equal to depth of wall including finishes plus 1/2 inch backbend on each side per SDI-100.

B. Exterior Frames: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16-gage).

C. Interior Frames: Cold-rolled steel sheet, minimum thickness of 0.053-inch (16 gage).

D. Exposed Finish: Factory prime finish for field painting.

E. Hardware Reinforcement: Fabricate with reinforcement plates from same material as frames with minimum reinforcement according to ANSI/SDI A250.6 and the following:

1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 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 6 spot welds.
3. Lock Face, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

F. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

G. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

H. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Post-installed Expansion Anchor: Minimum 3/8-inch diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor; form from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (20 gage) thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch high, unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy coating designation.

1. Material indicated to be fabricated from metallic coated steel sheet shall be of galvannealed steel sheet.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Mineral-Fiber Insulation: ASTM C 665, 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-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

F. Glazing: Comply with requirements in Division 8 Section "Glazing."

G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.8 FABRICATION

A. General: Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. 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. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and/or 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 welding.
3. Fabricate exterior frames with an additional flashing flange at the exterior side of frames as indicated on the Drawings.
4. Provide countersunk, flat or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
5. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

a. For conditions that do not allow for a floor anchor, provide an additional jamb anchor.

7. Jamb Anchors: Provide number and spacing of anchors as follows unless additional anchors are required for fire rating:

   a. 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 high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      5) Two anchors per head for frames 42 inches or more in width and mounted in metal-stud framed partitions.

   b. 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.

8. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

F. 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 hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so 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. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
5. Provide stops for installation 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.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
2. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    b. Install frames with removable stops located on secure side of opening.
2. Fire-Rated Openings: Install frames according to NFPA 80.
3. Floor Anchors: Secure with post-installed expansion anchors.
4. Insulation: Solidly pack mineral-fiber insulation inside frames that are not to be grouted.
5. Installation Tolerances: Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances. Adjust hollow-metal 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.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Doors: Comply with ANSI/SDI A250.8 as follows:
    a. Between Door and Frame at Jambs and Head: 1/8 inch plus or minus 1/32 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch minimum, 1/4 inch maximum.
    c. At 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.
    e. Between Door Face and Stop: 1/16 inch minimum, 1/8 inch maximum.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat or oval-head machine screws spaced uniformly not more than 9 inches on center and not more than 2 inches on center from each corner.

3.4 ADJUSTING AND REPAIR

A. Final Adjustments: Final adjustment as specified in Division 08 Section “Door Hardware.”

B. Remove grout and other bonding material from doors and frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 081200
INTERIOR ALUMINUM FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Knock-down, slip-on type interior aluminum frames for doors and windows.

B. Related Sections:

1. Division 08 Section “Flush Wood Doors” for wood doors.
2. Division 08 Section "Aluminum Framed Entrances and Storefronts” for aluminum storefront framing and entrances for exterior openings.
3. Division 08 Section “Door Hardware” for hardware for doors.
4. Division 08 Section "Glazing" for glazing in windows and doors.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, fire-resistance rating and finishes for aluminum.

B. Shop Drawings: Submit drawings for fabrication and installation of interior aluminum frames, including the following information:

1. Details of construction, joints, and connections.
2. Elevations of each opening type.
3. Conditions at openings, including coordination with glass and glazing requirements.
4. Location and installation requirements of door hardware and reinforcements.
5. Schedule of openings coordinated with numbering system used in contract documents.

C. Samples for Verification:

1. Framing Member: 12 inch long actual frame piece.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain interior aluminum frames from a single source from a single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer’s original unopened packaging to provide protection during transit and Project-site storage. Store in accordance with manufacturer’s written instructions and protect from damage.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not begin installation of aluminum frames until area of work has been completely enclosed and interior is protected from the elements.

B. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy standards. If necessary, provide artificial heating, cooling, and ventilation to maintain required environmental conditions.

1.7 WARRANTY

A. Provide manufacturer's written warranty against defects in materials and workmanship upon final completion and acceptance of Work in this section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: Drawings and Specifications are based on the following:

1. Western Integrated Materials, Inc.

a. Subject to compliance with requirements, provide products indicated or comparable products by:

1) Frameworks; an Assa Abloy Co.
2) Modulex, Inc.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Aluminum Extrusions: ASTM B221, Alloy 6063 T5.

2.3 ALUMINUM WINDOW AND DOOR FRAMING SYSTEMS

A. Framing Members, General: Manufacturer's standard extruded-aluminum knock-down, slip-on type door and window framing system designed for installation over gypsum board sheathed walls.

1. Member Thickness: 0.062 inch minimum.
2. Throat Size: Manufacturer's standard sizes for wall thickness required for Project conditions. Throat sizes available in 1/8 to 1/4 inch increments from 3-1/2 to 8 inches overall width.
3. Finish: Clear anodized.
4. Fire Rated Frames: Fabricate frames in accordance with NFPA80, listed and labeled by a qualified testing agency for the ratings indicated.

B. Door Framing: Profiles having integral stops and designed for 1-3/4 inch thick doors.

1. Door Mute: Manufacturer's standard heavy duty vinyl mute at all door frames.

C. Window Framing: Profiles designed for 1/4 inch single thickness glazing, flush glazed, with glazing located in the center of the framing member.

1. Glazing Bead: Manufacturer's standard heavy duty glazing gaskets.

D. Trim: Manufacturer's standard extruded aluminum snap-on type trim.

1. Size: 1-1/2 by 5/8 inches, flush style.

E. Brackets and Reinforcements: Manufacturer's standard with non-staining, non-ferrous shims for aligning system components.

F. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

2.4 FABRICATION

A. General: Factory-fabricate assemblies to greatest extent possible, assuring that installed units will be without warp, twist, bow, or other defect in appearance or function.

B. Framing Members, General: 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 with ends coped or mitered.
3. Provisions for field replacement of glazing without dismantling frame.
4. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Reinforce frames to receive surface mounted door hardware. Machine and prepare for hardware with concealed reinforcement plates drilled and tapped as required and fastened within framing with concealed screws.

D. Hardware Preparation: Factory prepare framing to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A21, 0.018 mm or thicker.

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 the Work.

1. Verify wall thickness does not exceed standard tolerance of ± 1/16”.

B. Do not proceed with installation until satisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install interior aluminum frames plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

1. Do not install damaged components.
2. Fit joints to produce hairline joints free of burrs and distortion.

B. Frame Installation:

1. General: Adhere to manufacturer’s printed installation instructions and approved shop drawings.

   a. At fire-protection-rated openings, install frames according to NFPA 80,

2. Use concealed installation clips to assure that splices and connections are tightly butted and properly aligned.
3. Secure clips to main structural extrusion components and not to snap-in or trim members.
4. Place pre-finished frames after wall finishing is complete, braced securely to achieve plumb, planar installation. Remove braces after anchorages have achieved final set, leaving frames in smooth, undamaged condition.
5. Anchors: Use screws, per manufacturer’s standard installation instructions, for secure attachment to type of wall condition.
6. Do not use screws or other fasteners that will be exposed to view when installation is complete.

C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with framing manufacturer's written instructions.

3.3 CLEANING AND PROTECTION

A. Clean-up: Clean frames using mild soap and water, do not use abrasive agents.

B. Replace damaged frames that cannot be satisfactorily repaired.

C. Protect installed products until completion of the Project.

END OF SECTION

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SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core flush wood veneer doors for transparent finish.
2. Factory finishing of solid core doors.

B. Related Sections:

1. Division 08 Section “Door Louver and Lite Frames” for louver and light frames for wood doors.
2. Division 08 Section “Hollow Metal Doors and Frames” for door frames for wood doors.
3. Division 08 Section “Door Hardware” for door hardware for wood doors.
4. Division 08 Section "Door Hardware" for testing of fire rated door installations egress doors with panic hardware and/or electrified hardware.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type 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 cutouts.

C. Schedule: Provide a schedule prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Samples for initial selection: For factory-finished doors, showing full range of available colors.

E. Samples for Verification: For factory-finished doors, minimum 4 inch x 6 inch pieces prepared on actual door facing materials for selected color(s).

F. Warranty: Sample of special warranty.

1.4 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. Wrap bundles of doors in plastic sheeting for doors packaged in cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period. Comply with manufacturer’s published recommendations.

1.6 WARRANTY

A. Special Warranty: 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. Delamination of veneer.
    b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods Inc.
2. Chappell Door Co.
3. Eggers Industries; Architectural Door Division.
4. Marshfield Door Systems, Inc
5. VT Industries Inc.

B. Source Limitations: Obtain flush wood doors from one source from a single manufacturer.

2.2 SOLID CORE VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. General Description: Interior, solid core, five-ply flush wood veneer faced doors for transparent finish.

B. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.

C. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

D. Fire-Rated Wood Door Assemblies: Where fire rated assemblies are indicated, provide assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

E. Interior Solid-Core Doors:

1. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
2. ANSI/WDMA I.S. 1A Grade: Custom.
3. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.
4. Faces: Single-ply wood veneer not less than 1/50 inch thick.
    a. Species: Select white birch.
    b. Cut: plain-sliced.
    c. Match between Veneer Leaves: Book match.
    d. Assembly of Veneer Leaves on Door Faces: Running match.
    e. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
5. Exposed Vertical and Top Edges: Applied wood edges of same species as faces and covering edges of crossbands.
    a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
    b. Fire-Rated Pairs of Doors: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
    c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
        1) Screw-Holding Capability: 475 lbf in accordance with WDMA T.M. 10.
6. Cores: Provide Cores for doors as follows:

a. Material:

1) Particleboard core doors unless otherwise indicated.
2) Structural-composite-lumber cores in lieu of particleboard cores for doors indicated to receive exit devices as indicated on the Drawings and scheduled in Division 08 Section “Door Hardware.”
3) Mineral core doors where required for fire resistance rating(s) indicated.

b. Particleboard Core Doors: Particleboard, ANSI A208.1, Grade LD-2 unless otherwise indicated and made with binder containing no urea-formaldehyde resin.

1) Blocking for Particleboard Doors: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware and as follows:

a) 5-inch top-rail blocking, in doors indicated to have closers.
b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.

c. Structural Composite Lumber Cores: WDMA I.S. 10 structural-composite-lumber cores containing no urea-formaldehyde resin.

1) Screw Withdrawal, Door Face: 475 lbf.
2) Screw Withdrawal, Vertical Door Edge: 475 lbf.

d. Mineral Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

1) Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as follows:

a) 5-inch top-rail blocking.
b) 5-inch bottom-rail blocking, in doors indicated to have protection plates.
c) 4-1/2-by-10-inch lock blocks or 5-inch midrail blocking, in doors indicated to have exit devices.

2.3 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

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, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.

C. Openings: Factory cut and trim openings through doors.

1. Vision Panels: Openings in doors for vision panels or other glazing shall be such that the bottom edge of visible glass shall be not more than 43 inches above the finished floor surface (Ref. CBC 11B-404.2.11).

2.4 FACTORY FINISHING, TRANSPARAENT FINISHED DOORS

A. General: Factory finish doors for transparent finish; 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. Finish faces, all four edges, edges of cutouts, and mortises.
2. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish:

1. ANSI/WDMA I.S. 1A Grade: Custom.
2. Finish: ANSI/WDMA I.S. 1A TR-4 conversion varnish or TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Effect: Semi-filled finish, produced by applying an additional finish coat to partially fill the wood pores.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed 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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For hardware and hardware installation, refer to Division 08 Section "Door Hardware."

B. Installation: Install doors to comply with manufacturer's written installation instructions, referenced quality standards, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

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.

3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Factory Finished Doors: Replace doors that are damaged or 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

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Access doors and frames for walls and ceilings.

B. Related Sections include the following:

1. Division 07 Section "Roof Access Hatches" for roof hatches.
2. Division 22 and 23 Sections as applicable for access to Plumbing and Mechanical valves and equipment behind finished surfaces.
3. Division 26 Sections as applicable for access to Electrical equipment behind finished surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.

B. Access Door and Frame Schedule: Provide access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 COORDINATION

A. Coordinate locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work with mechanical and plumbing trades.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Babcock-Davis.
2. Dur-Red Products.
3. J. L. Industries, Inc.
4. Karp Associates, Inc.
5. Larsen's Manufacturing Company.
6. Milcor Inc.
7. Nystrom, Inc.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Non-Fire Resistance Rated Flush Access Doors and Frames with Exposed Trim: Access doors with face of door flush with frame, with exposed flange and concealed hinge.

1. Material:
    a. Uncoated or Metallic Coated Steel Sheet:
        1) Locations: Non-fire resistance rated wall and ceiling surfaces of painted gypsum board.
        2) Doors: Nominal 0.074 inch (uncoated) or 0.078 inch (coated) (14 gage) thickness.
        3) Frames: Nominal 0.060 inch (uncoated) or 0.064 inch (coated) (16 gage) thickness.
        4) Finish: Factory prime finish, manufacturer’s standard baked on rust inhibitive gray primer.
    b. Stainless Steel Sheet:
        1) Locations: Non-fire resistance rated wall and ceiling surfaces with ceramic tile finish or prefinished wall paneling.
        2) Doors: Nominal 0.062 inch (16 gage) thickness.
        3) Frames: Same material and thickness as doors.
        4) Finish: No. 4.
2. Hinges: Manufacturer’s standard concealed spring pin hinge.
3. Latch/Lock:
    a. Latch: Cam latch operated by screwdriver with interior release.

1) Provide where access doors are located in private or semi-private areas such as office spaces, storage rooms, equipment rooms, and private toilet rooms.

b. Lock: Manufacturer’s standard key operated cylinder cam lock. Furnish two keys per lock and key all locks alike.

1) Provide where access doors are located in public areas such as exterior walls and ceilings, and public toilet rooms.

4. Size: As indicated on drawings or as required to provide access to valves and equipment concealed behind finished surfaces.

D. Fire-Rated, Flush Access Doors and Frames with Exposed Trim:

1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Material:

a. Uncoated or Metallic Coated Steel Sheet:

1) Locations: Fire resistance rated wall and ceiling surfaces of painted gypsum board.
2) Doors: Nominal 0.036 inch (uncoated), 0.40 inch (coated) (20 gage) thickness.
3) Frames: Nominal 0.060 inch (uncoated) or 0.064 inch (coated) (16 gage) thickness.
4) Finish: Factory prime finish, manufacturer’s standard baked on rust inhibitive gray primer.

b. Stainless Steel Sheet:

1) Locations: Fire resistance rated wall and ceiling surfaces with ceramic tile finish or prefinished wall paneling.
2) Doors: Nominal 0.038 inch (20 gage) thickness.
3) Frames: Nominal 0.062 inch (16 gage) thickness.
4) Finish: No. 4.

4. Hinges: Manufacturer’s standard flush continuous piano hinge.
5. Closer: Spring type, automatic acting.
6. Latch/Lock:

a. Latch: Knurled knob operated latch.

1) Provide where access doors are located in private or semi-private areas such as office spaces, storage rooms, equipment rooms, and private toilet rooms.

b. Lock: Manufacturer’s standard key operated cylinder cam lock. Furnish two keys per lock and key all locks alike.

1) Provide where access doors are located in public areas such as exterior walls and ceilings, and public toilet rooms.

7. Size: As indicated on drawings or as required to provide access to valves and equipment concealed behind finished surfaces.

2.3 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.

1. Finish: Directional satin finish, No. 4.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Size: As indicated on Drawings or size as required for access to concealed spaces, valves, or equipment.

1. Access to attic spaces shall not be less than 22 x 30 inches clear opening.
2. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

C. 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.

D. Doors and Frames: 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.

1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
2. Provide mounting holes in frames for attachment of units to metal or wood framing, mounting holes shall not be located in exposed surfaces of frames.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.5 FINISHES

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. 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.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil for topcoat.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
    a. Run grain of directional finishes with long dimension of each piece.
    b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
    c. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 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.

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SECTION 084113
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Aluminum framed storefront systems.
2. Aluminum framed entrance door systems.

B. Related Sections:

1. Division 08 Section "Aluminum Windows" for factory-assembled and glazed window units.
2. Division 08 Section "Glazing" for glass for glazing of aluminum storefront systems.
3. Division 08 Section "Door Hardware" for swinging aluminum entrance door hardware not specified in this section.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. Include details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Include point to point wiring routing for electrically operated or controlled door operating hardware.

C. Governing Agency Deferred Approval: Projects under the jurisdiction of the Division of the State Architect (DSA) require storefront window systems with framing member spans greater than 10 feet to have the design of framing members reviewed and approved by the Division of the State Architect through a Deferred Approval (Refer to DSA Interpretive Regulation IR 24-2 for additional information; IR 24-2 is available on DSA's website).

1. Window system Deferred Approval submittal shall include necessary shop drawings, details, and structural calculations prepared, stamped, and signed by a structural engineer licensed in the State of California. The storefront supplier or installer shall be responsible for the design and engineering calculations and drawings, and shall be responsible for responding to and resolving any comments from the DSA.
2. The Deferred Approval submittal shall be submitted to the Architect through the General Contractor. The Architect will transmit the Deferred Approval submittal to the Division of the State Architect.

D. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

E. Qualification Data: For installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

G. Field quality-control reports.

H. Sample Warranties: For special warranties.

I. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.5 MOCKUPS

A. Mockups: Build mockups to verify compliance with Specifications, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at location(s) as directed by Architect.

   a. At least one mockup shall be required for each different installation condition and shall include head, jamb, and sill conditions.

2. Mockup of storefront framing shall be integrated and coordinated with associated weather resisting components including but not limited to weather resistive barriers, exterior wall insulation, flashing, wall finishes.
3. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.7 COORDINATION

A. Coordinate installation of products specified in this Section with installation of products specified in the following Sections:

1. Division 07 Section “Weather Resistive Barriers.”
2. Division 07 Section “Sheet Metal Flashing and Trim.”
3. Division 07 Section “Formed Metal Wall Panels”.
4. Additional Sections as applicable to products comprising exterior wall finishing materials and/or systems.
5. Division 09 Section “Gypsum Board.”

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within 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 created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, peeling, or chipping.

2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, to design aluminum-framed entrances and storefronts, including comprehensive engineering analysis, using performance requirements and design criteria indicated.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

    a. Deflection exceeding specified limits.
    b. Thermal stresses transferring to building structure.
    c. Glass breakage.
    d. Noise or vibration created by wind and thermal and structural movements.
    e. Loosening or weakening of fasteners, attachments, and other components.
    f. Failure of operating units.
    g. Sealant failure.

C. Structural Design Wind Loads: Storefront assemblies shall be designed to withstand wind loads determined according to ASCE/SEI 7 and the 2019 California Building Code.

1. Wind Loads: As indicated on Drawings and not less than 20 lbf/sq. ft., acting inward and outward.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

E. Structural Testing: Aluminum-framed storefront systems shall comply with testing according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Water Penetration Under Static Pressure: Test according to ASTM E331; there shall be no evidence water penetration through fixed glazing and framing areas, including entrance doors, when tested according to minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than of 6.25 psf.

G. Seismic Performance: Aluminum framed entrances and storefront assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the 2019 California Building Code.

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."

H. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.41 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
b. Entrance Doors: U-factor of not more than 0.68 Btu/sq. ft. x h x deg F as determined according to NFRC 100.

2. Solar Heat-Gain Coefficient (SHGC):

a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.26 as determined according to NFRC 200.
b. Entrance Doors: SHGC of not more than 0.22 as determined according to NFRC 200.

3. Air Leakage:

a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a minimum static-air-pressure differential of 1.57 lbf/sq. ft. when tested according to ASTM E 283.
b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

4. Condensation Resistance Factor (CRF):

a. Fixed Glazing and Framing Areas: CRF for the system of not less than 35 as determined according to AAMA 1503.
b. Entrance Doors: CRF of not less than 57 as determined according to AAMA 1503.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes of 120 degrees F ambient and 180 degrees F material surface.

J. Accessibility Requirements for Entrances: Comply with applicable requirements of the 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and the 2019 California Building Code.

2.2 MANUFACTURERS

A. Basis-of-Design Products: In other Part 2 Articles where named manufacturer's products are indicated as "Basis of Design," Drawings and Specifications are based on products manufactured by:

1. Kawneer North America; an Alcoa company.

a. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:

1) EFCO Corporation.
2) Oldcastle Building Envelope.
3) United States Aluminum.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from a single source from a single manufacturer.

2.3 STOREFRONT FRAMING SYSTEMS

A. Framing Members: Manufacturer's extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Basis of Design: Design, Drawings, and Specifications are based on the following systems:
    a. Exterior Framing:
        1) Kawneer; TriFab Versaglaze 451T.
    b. Interior Framing:
        1) Kawneer; TriFab Versaglaze 451.
2. Sizes:
    a. 2 by 4-1/2 inches.
    b. 1-3/4 by 4-1/2 inches.
3. Wall Thickness: Not less than 0.080 inches.
4. Construction: Dual thermal break.
5. Glazing Systems:
    a. Retained mechanically with gaskets on four sides, may be installed from inside or outside.
    b. Retained mechanically with gaskets on two sides and structural sealant on two sides.
6. Glazing Plane:
    a. Exterior Framing: Front, where indicated.
    b. Exterior Framing: Rear, where indicated.
    c. Interior Framing: Center.
7. Glazing Thickness:
    a. Exterior Framing: 1-inch, unless otherwise indicated.
    b. Interior Framing: ¼ inch.
8. Finish: Clear anodic finish.
9. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
10. Steel Reinforcement: Where required by manufacturer’s design.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR SYSTEMS

A. Standard Duty Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation fabricated from extruded-aluminum tubular stiles rails.

1. Basis of Design: Design, Drawings, and Specifications are based on the following:
    a. Kawneer, 500 Standard Entrance.
2. Door Stile Design: Wide stile design.
    a. Vertical Stile Width: 5 inches wide not including glazing stops.
3. Door Width and Height: As indicated on Drawings.
4. Overall Thickness: 1-3/4 inches.
5. Material Thickness: 0.125-inch-thick, extruded-aluminum tubular rail and stile members.
6. Top Rail: 5 inches wide minimum not including glazing stops.
7. Bottom Rail: 10 inches wide minimum not including glazing stops.
8. Glazing: 1-inch thick insulated glazing.
9. Finish: Match storefront framing.

B. Glazing Stops and Gaskets: 0.050 inch thick, square, snap-on, extruded-aluminum stops and preformed gaskets.

1. Provide non-removable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Division 08 Section "Door Hardware."

B. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

2.6 GLAZING

A. Glazing: Glazing shall be as specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Glazing Sealants: As recommended by storefront system manufacturer.

1. Sealants shall comply with requirements specified in Division 07 Section “Joint Sealants.”
2. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by weatherseal-sealant and storefront manufacturers for this use.

E. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Framing System Gaskets: Manufacturer's standard as recommended by manufacturer.

C. Perimeter Joint Sealants: As recommended by storefront system manufacturer.

1. Sealants shall comply with requirements specified in Division 07 Section “Joint Sealants.”
2. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete Anchors: Hot-dip galvanized steel or stainless steel threaded or wedge-type anchors complying with requirements of Division 03 Section “Post-Installed Concrete Anchors”.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials.

F. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.8 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

C. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. 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 with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior or exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Storefront Framing: Fabricate components for on-site assembly using shear-block, screw spline or stick system as indicated by deferred design approval.

1. Provide head-and-sill-receptor system with shear blocks where indicated.

G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. Provide compression weather stripping at fixed stops at all doors.

H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.
3. Door stiles and rails shall have hairline joints at corners. Heavy concealed reinforcement brackets shall be secured with screws and shall be of deep penetration and fillet welded.
4. All doors shall have an adjusting mechanism in the top rail to provide for minor clearance adjustments.

I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.7 mils (0.018) mm or thicker.

2.11 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C1401 recommendations, including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure non-movement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

I. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

J. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

K. Install glazing as specified in Division 08 Section "Glazing."

L. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

M. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 INSTALLATION OF STRUCTURAL GLAZING

A. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

B. Set glazing into framing according to sealant manufacturer and framing manufacturer's written instructions and standard practice. Use a spacer or backer as recommended by manufacturer.

C. Set glazing with proper orientation so that coatings face exterior or interior as specified.

D. Hold glazing in place using temporary retainers of type and spacing recommended by manufacturer, until structural sealant joint has cured.

E. Apply structural sealant to completely fill cavity, according to sealant manufacturer and framing manufacturer's written instructions and in compliance with local codes.

F. Apply structural sealant at temperatures indicated by sealant manufacturer for type of sealant.

G. Allow structural sealant to cure according to manufacturer's written instructions.

H. Clean and protect glass as indicated in Section 088000 "Glazing."

3.4 INSTALLATION OF WEATHERSEAL SEALANT

A. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass as recommended by sealant manufacturer.

B. Install weatherseal sealant to completely fill cavity, according to sealant manufacturer's written instructions, to produce weatherproof joints.

3.5 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection 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:
    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2-inch-wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.6 FIELD QUALITY CONTROL

A. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts as directed by Architect.

1. Testing shall be performed by the Contractor in the presence of the Owner's Inspector. The Owner's Inspector shall be responsible for observing and reporting results of testing.
2. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    a. Perform a minimum of three tests per building at areas as directed by Architect.

B. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

C. Inspection Reports: Inspection reports shall be prepared by the Owner's Inspector.

3.7 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer and as specified in Division 8 Section "Door Hardware."

END OF SECTION

SECTION 084413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazed aluminum curtain walls.

B. Related Sections:

1. Division 07 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this Section.
2. Division 08 Section "Aluminum Framed Entrances and Storefronts" for storefront framing and aluminum entrance doors.
3. Division 08 Section “Aluminum Windows” for prefabricated window units.
4. Division 08 Section "Glazing" for glass in curtain wall and other applications.

1.3 DEFINITIONS

A. For fenestration industry standard terminology and definitions, refer to the American Architectural Manufacturers Association Glossary (AAMA AG-13).

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. Include details of each type of vertical-to-horizontal intersection of curtain wall framing, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.

e. Flashing and drainage.

C. Governing Agency Deferred Approval: Projects under the jurisdiction of the Division of the State Architect (DSA) require window systems with framing member spans greater than 10 feet to have the design of framing members reviewed and approved by the Division of the State Architect through a Deferred Approval (Refer to DSA Interpretive Regulation IR 24-2 for additional information; IR 24-2 is available on DSA's website).

1. Curtain Wall Deferred Approval submittal shall include necessary shop drawings, details, and structural calculations prepared, stamped, and signed by a structural engineer licensed in the State of California. The curtain wall supplier or installer shall be responsible for the design and engineering calculations and drawings and shall be responsible for responding to and resolving any comments from the DSA.
2. The Deferred Approval submittal shall be submitted to the Architect through the General Contractor. The Architect will transmit the Deferred Approval submittal to the Division of the State Architect.

D. Samples:

1. Provide a verification sample for each type of exposed finish required, in manufacturer's standard sizes.
2. Provide a fabrication sample of each vertical to horizontal intersection of curtain wall system, made from 12" lengths of full-size components with glazing.

E. Qualification Data: For installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for curtain wall systems, indicating compliance with performance requirements.

G. Field quality-control reports.

H. Sample Warranties: For required special warranties.

I. Maintenance Data: For curtain wall systems to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.6 MOCKUPS

A. Mockups: Build mockups to verify compliance with Specifications, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at location(s) as directed by Architect.

    a. At least one mockup shall be required for each different installation condition and shall include head, jamb, and sill conditions.

2. Mockup of curtain wall framing shall be integrated and coordinated with associated weather resisting components including but not limited to weather resistive barriers, exterior wall insulation, flashing, wall finishes.
3. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.8 COORDINATION

A. Coordinate installation of products specified in this Section with installation of products specified in the following Sections:

1. Division 07 Section “Weather Resistive Barriers.”
2. Division 07 Section “Sheet Metal Flashing and Trim.”
3. Division 07 Section “Formed Metal Wall Panels.”
4. Division 07 Section “Metal Soffit Panels.”
5. Division 09 Section “Gypsum Board.”
6. Additional Sections as applicable to products comprising exterior wall finishing materials and/or systems.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of curtain wall systems that do not comply with requirements or that fail in materials or workmanship within 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 created by wind and thermal and structural movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, peeling, or chipping.

2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of curtain wall systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Curtain wall systems shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferring to building structure.
c. Glass breakage.
d. Noise or vibration created by wind and thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Failure of operating units.
g. Sealant failure.

B. Structural Design Wind Loads: Curtain wall systems shall be designed to withstand wind loads determined according to ASCE/SEI 7 and the 2019 California Building Code.

1. Wind Loads: As indicated on Drawings and not less than 20 lbf/sq. ft., acting inward and outward.

C. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

D. Structural Testing: Curtain wall systems shall comply with testing according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, curtain wall assemblies do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Air Infiltration: Test according to ASTM E283 for infiltration as follows:

1. Fixed Framing and Glass Area: Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.2 lb/sq. ft.
2. Entrance Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft. for single doors.

F. Water Penetration Under Static Pressure: Test according to ASTM E331; there shall be no evidence water penetration through fixed glazing and framing areas, including entrance doors, when tested according to minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than of 12 psf as defined in AAMA 501.

G. Seismic Performance: Curtain wall assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the 2019 California Building Code.

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."

H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor), Simulation: Fixed Glazing and Framing Areas; U-factor for SSG systems of not more than 0.38 overall (with glass U-factor of 0.24) Btu/sq. ft. x h x deg F as determined according to NFRC 100 or AAMA 507.
2. Solar Heat-Gain Coefficient (SHGC): Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.31 overall, (with glass SHGC of 0.30) as determined according to NFRC 200.
3. Condensation Resistance (CRF): Fixed glazing and framing areas as a SSG system shall have a condensation resistance rating of no less than 71 (frame) and 62 (glass) as determined according to AAMA 1503.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes of 120 degrees F ambient and 180 degrees F material surface.

2.2 MANUFACTURERS

A. Basis-of-Design Products: In other Part 2 Articles where named manufacturer’s products are indicated as “Basis of Design”. Design, Drawings and Specifications are based on products manufactured by:

1. Kawneer North America; an Alcoa company.

a. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:

1) EFCO Corporation.
2) Oldcastle Building Envelope.
3) United States Aluminum.

B. Source Limitations: Obtain all components of curtain wall system, including framing and accessories, from a single source from a single manufacturer.

2.3 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

A. Framing Members: Manufacturer's extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Basis of Design; Design, Drawings, and Specifications are based on the following:

a. KAWNEER 1600 Wall System 2 - aluminum curtain wall framing.

2. Size: 2-1/2 inches (sightline) by 7-1/2 inch nominal overall depth.
3. Wall Thickness: Not less than 0.070 inches (1.8 mm).
4. Construction: Thermally broken.

5. Glazing System: Outside-glazed structural silicone glass (SSG). Glazing retained mechanically with gaskets at overall perimeters and certain horizontal members only where indicated.
6. Glazing Plane: As indicated on Drawings.
7. Glazing Thickness: 1-inch, unless otherwise indicated.
8. Finish: Clear anodic finish.
9. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
10. Steel Reinforcement: As required by manufacturer’s design.

B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing; include snap-on aluminum trim that conceals fasteners.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, non-ferrous shims for aligning system components.

D. Testing: AAMA501.

2.4 GLAZING

A. Glazing: Glazing shall be as specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Glazing Sealants: As recommended by curtain wall system manufacturer.

1. Sealants shall comply with requirements specified in Division 07 Section “Joint Sealants.”
2. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Perimeter Joint Sealants: As recommended by curtain wall system manufacturer.

1. Sealants shall comply with requirements specified in Division 07 Section “Joint Sealants.”

2. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing compatible with adjacent materials.

E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.6 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

C. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. 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 with ends coped or mitered.

3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior or exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.7 mils (0.018) mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure non-movement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing non-conductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

I. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

J. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

K. Install glazing as specified in Division 08 Section "Glazing."

L. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install glazed aluminum curtain walls to comply with the following maximum erection 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:
    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 FIELD QUALITY CONTROL

A. Field Quality-Control Testing: Perform the following test on representative areas of curtain wall assemblies as directed by Architect.

1. Testing shall be performed by the Contractor in the presence of the Owner's Inspector. The Owner's Inspector shall be responsible for observing and reporting results of testing.
2. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
    a. Perform a minimum of three tests at areas as directed by Architect.

B. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

C. Inspection Reports: Inspection reports shall be prepared by the Owner's Inspector.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for swinging doors.

B. Related Sections include but are not limited to the following:

1. Division 08 Section "Hollow Metal Doors and Frames."
2. Division 08 Section "Interior Aluminum Frames."
3. Division 08 Section "Flush Wood Doors."
4. Divison 08 Section “Aluminum-Framed Entrances and Storefronts”
5. Division 26 Electrical Sections as applicable for connections to electrical power.
6. Division 26 Electrical Sections as applicable for connections to access control.

1.3 REFERENCES AND ABBREVIATIONS

A. Industry standard references and abbreviations shall be as follows:

1. ADA: Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design.
2. BHMA: Builders' Hardware Manufacturers Association.
3. CCR: California Code of Regulations, Title 24, Part 2, California Building Code.
4. DHI: Door and Hardware Institute.
5. NFPA: National Fire Protection Association.

a. NFPA 80: Fire Doors and Windows.
b. NFPA 101: Life Safety Code.
c. NFPA 105: Smoke and Draft Control Door Assemblies
d. NFPA 252: Fire Tests of Door Assemblies.

6. UL - Underwriters Laboratories.

a. UL 10C: Positive Pressure Fire Tests of Door Assemblies.
b. UL 305: Panic Hardware.

7. WHI: Warnock Hersey Incorporated.
8. SDI: Steel Door Institute.

9. NAAMM: National Association of Architectural Metal Manufacturers.

1.4 SUBSTITUTIONS

A. Substitutions: Substitutions will only be allowed by substitution requests submitted in accordance with Division 01 Section “Substitution Procedures” prior to the bid date.

1. In Part 2 Articles where manufacturers are listed for various product types and only one manufacturer is listed with no alternate manufacturers indicated, manufacturer listed is an established Owner standard and substitutions will not be allowed.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule. Organize schedule vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include the following information:

1. Type, style, function, size and finish of each hardware item.
2. Name, part number and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of hardware set coordinated with floor plans and door schedule.
5. Explanation of all abbreviations, symbols and codes contained in schedule.
6. Mounting locations for hardware.
7. Door and frame sizes and materials.
8. List of manufacturers used and their nearest representative with address and phone number.
9. Keying information.
10. Manufacturer’s catalog cut sheets.

C. Wiring Diagrams: Power, signal, and control wiring for electrified hardware. Include interface between electrified hardware and control system wiring.

D. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include “as installed” final hardware and keying schedule.

E. As-Built Schedule: As-built/as-installed schedule with closeout documents, including keying schedule, wiring diagrams, manufacturers’ installation, adjustment and maintenance information, and supplier’s final inspection report.

F. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in the installation of commercial door hardware with five years documented experience.

B. Supplier Qualifications: A recognized architectural door hardware supplier with warehousing facilities in the Project's vicinity that has a record of successful in-service performance for supplying door hardware that is similar in quantity, type, and quality to that specified for this Project, and who employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

a. Architectural Hardware Consultant Responsibilities:

1) Detailing, scheduling and ordering of finish hardware.
2) Meeting with Owner to finalize keying requirements and to obtain final instructions in writing.
3) Stock parts for products supplied and be capable of repairing and replacing hardware items found defective within warranty periods.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given types and sizes of openings and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Conference participants shall include Owner’s lock system representative, Supplier’s Architectural Hardware Consultant Contractor, and Architect. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Attendees shall include Owner, Contractor, Architect, Project Inspector, Installer, and Supplier's Architectural Hardware Consultant. Review methods and procedures related to door hardware including, but not limited to, the following:

1. Hardware products and schedule.
2. Installation procedures and coordination required with related work.
3. Review Owner's keying standards.

1.7 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, and chemicals.

D. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

E. Deliver permanent keys and cores directly from lock manufacturer to Owner's designated representative by secured delivery.

1.8 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm systems and similar control systems.

C. 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.

D. Review, compare, and coordinate scheduled hardware with doors, frames, and adjacent floor and wall conditions for non-compatible mounting and/or operating conditions; notify Architect in writing of any conflicts.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of operators and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Established from date of Substantial Completion as follows:

a. Closers: Thirty (30) years.
b. Locksets: Three (3) years
c. All other hardware: Two (2) years.

1.10 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND REGULATORY REQUIREMENTS

A. Regulatory Requirements: Comply with the 2010 ADA Standards for Accessible Design, ANSI A117.1, and the 2019 California Building Code.

1. Opening Hardware, Mounting Height and Operation: Operable parts of door hardware shall be 34 inches minimum and 44 inches above the floor. Hand activated door opening hardware shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist to operate; the force required to activate operable parts shall not exceed 5 lbs. Egress doors shall be readily openable from the egress side without the use of a key or special knowledge or effort. The unlatching of any door or leaf shall not require more than one operation (2019 CBC 11B-309.4 & 11B-404.2.7, 1010.1.9).

2. Closers, Opening Force: The opening force shall be the push/pull effort applied perpendicular to the face of the door at the operating hardware; other than required fire rated doors, the effort to operate doors shall not exceed 5 pounds; required fire rated doors may have the opening force increased to the minimum amount necessary to close and latch the door, but shall not exceed 15 pounds (2019 CBC 11B-404.2.9).
3. Closers, Closing Sweep Period: The closing sweep period for doors shall be such that from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch (2019 CBC 11B-404.2.8.1).
4. Thresholds: The height differential between the tops of thresholds and adjacent floor or landing surfaces shall not be more than 1/2 inch; offsets exceeding 1/4 inch shall be beveled with a 2:1 (horizontal to vertical) maximum slope (2019 CBC 11B-404.2.5).
5. Smooth Door Surface: The bottom 10 inches of doors shall have a smooth, uninterrupted surface to allow the door to be opened by a wheel chair footrest without creating a trap or hazardous condition (2019 CBC 11B-404.2.10).
6. New Buildings on a K-12 Public School campus shall be provided with locks which allow the doors to classrooms and any other room with an occupant load of five or more persons to be locked from the inside. Locks shall conform to the specification and requirements of Section 1010.1.11. Exceptions include doors that are normally locked form the outside, relocatable moved within the same campus, and reconstruction projects.

2.2 SCHEDULED DOOR HARDWARE

A. Basis of Design Products: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article. Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Subject to compliance with requirements, provide products indicated or comparable products by manufactures listed below:

HARDWARE TYPE	**BASIS OF DESIGN MANUFACTURER**	**MANUFACTURERS OF COMPARABLE PRODUCTS**
Butt Hinges	Ives	Hager
Locksets, Latchsets, Cylinders, and key system	Schlage	Owner’s Standard
Exit Devices	Von Duprin	Owner’s Standard
Closers	LCN	Owner’s Standard
Door Trim (Pulls, Plates, Bolts, Coordinators, Stops)	Ives	Trimco
Thresholds and Seals	Zero	NGP

2.3 DOOR HARDWARE PRODUCTS

A. General: Door hardware products shall comply with referenced Accessibility Requirements.

B. Continuous Hinges: Full mortise, heavy duty stainless steel continuous hinge.

C. Lock and Latch Sets: Cylindrical or mortise latch/lock sets as scheduled with lever handled trim and as follows:

1. Mortise Locksets:

a. Chassis: Cold-rolled steel, handing field-changeable without disassembly.
b. Latchbolts: 3/4 inch throw, stainless steel anti-friction type.
c. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.

1) Spindles: Security design with independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.

d. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
e. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction and lips of sufficient length to clear trim and protect clothing.
f. Certifications:

1) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
2) ANSI/ASTM F476-84 Grade 31 UL listed.

2. Cylindrical Locksets: Extra Heavy Duty and as follows:

a. Chassis: Cylindrical design; corrosion-resistant plated cold-rolled steel, through-bolted.
b. Locking Spindle: Stainless steel, integrated spring and spindle design.
c. Latch Retractors: Forged steel; balance of inner parts corrosion-resistant plated steel or stainless steel.
d. Latchbolt: Solid steel.
e. Backset: 2-3/4 inches unless otherwise indicated.
f. Lever Trim: Accessible design, independent operation, spring-cage supported, minimum 2 inch clearance from lever mid-point to door face.
g. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction and lips of sufficient length to clear trim and protect clothing.
h. Certifications:

1) ANSI A156.2, 1994, Series 4000, Grade 1.
2) UL listed for A label and lesser class single doors up to 4ft x 8ft.

D. Exit Devices: Surface mounted rim type exit devices as scheduled.

1. Certifiable by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 1994 standards.
2. Handing: Non-handed basic device design with center case interchangeable with all functions.
3. Fluid Damper Return: Devices shall have quiet return fluid dampeners.
4. Latchbolts: Latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
5. Outside Trim: As scheduled; where operating levers are provided, provide manufacturer's standard "breakaway" feature for lever trim.
6. Strikes: All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
7. Fasteners: Exit Devices to be sex-bolted through doors.
8. Glazing Bead Kits: Furnish glass bead kits where required for doors with glazing.
9. Removable Mullions: Provide keyed removable mullions where indicated for pairs of doors with rim style exit devices.

E. Surface Closers: Fully adjustable full rack-and-pinion type cylinder with cast iron body and non-ferrous cover, heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring, and as follows:

1. ISO 2000 certified; units stamped with date-of-manufacture code.
2. Certifiable by independent testing laboratory that device has completed over 10,000,000 cycles and can still meet ANSI/BHMA A156.4
3. Non-sized, non-handed, and fully adjustable with separate adjusting valves for closing speed, latching speed, and backcheck; and with a fourth valve for delayed action where scheduled.
4. Arms and Mounting: Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated:

    a. Regular Arm: Pull side, door mounted, for doors swinging into rooms.
    b. Parallel Arm: Push side, door mounted, for doors swinging out of rooms.
    c. Provide extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
    d. Supplemental Brackets: Coordinate closer mounting requirements with other hardware items and provide supplemental mounting brackets where required for a complete installation.

5. Fluid: Closers shall utilize a stable fluid withstanding a temperature range of 120 degrees F to -30 degrees F without requiring seasonal adjustment of closer speed to properly close the door. Fluid shall be non-flaming and shall not fuel door or floor covering fires.
6. Fasteners: Closers to be sex-bolted through doors.

F. Stops, Holders, and Bumpers: Provide units as scheduled; all doors shall be provided with a stop or bumper; stops and bumpers shall be mounted within 8 inches of the outside (strike) edge of the door and shall be not more than 4 inches from walls.

1. Overhead Stops: Provide surface mounted overhead stops where floor or wall stops, or closers with stops cannot be utilized.
2. Flip down door mounted stops shall not be allowed.

G. Protection Plates: Kick, armor, or mop plates, 0.050 inch thick stainless steel with four edges beveled, 2 inches less than door width; kick plates to be 10 inches high, mop and armor plate heights shall be as indicated.

H. Thresholds: Aluminum and as detailed or scheduled; provide at all exterior doors.

I. Door Bottoms: Provide sweep seals at out swinging exterior doors unless other types are scheduled.

J. Seals: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated, scheduled, or required for smoke rated openings.
   1. Resilient Seal Material: Polyurethane, polypropylene, nylon brush, silicone rubber or solid high-grade neoprene as scheduled. Vinyl seal material shall not be acceptable.

K. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.4 KEYING

A. Furnish a Grand Master, Master, keyed alike or keyed different system as directed by the Owner or Architect.

B. Existing System: Schlage Primus interchangeable core system. Verify keyway with owner. Confirm lock cylinders and keying with Owner and provide system as directed by the Owner.

C. Key Blanks: Standard "6" pin bow key blank; tag to identify.

D. Supply keys and blanks as follows:

   1. Supply 2 cut change keys for each different change key code.
   2. Supply 1 uncut key blank for each change key code.
   3. Supply 6 cut master keys for each different master key set.
   4. Supply 3 uncut key blanks for each master key set.
   5. Supply 2 cut control keys and 2 uncut control keys.
   6. Supply construction cores with 10 keys and 2 control keys.

2.5 FINISHES

A. Generally to be satin chromium US26D (626) unless otherwise noted.

B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.

C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

D. Aluminum items to be finished clear anodized aluminum US28 (628), except thresholds which can be furnished as standard mill finish.

2.6 FASTENERS

A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.

B. Screws for butt hinges shall be flathead, countersunk, full-thread type.

C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.

D. Provide stainless steel expansion anchors for attaching hardware items to concrete or masonry.

E. All exposed fasteners shall have a phillips head.

F. Finish of exposed screws to match surface finish of hardware or other adjacent work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install each door hardware item to comply with manufacturer's written instructions and requirements of the Door Hardware Institute. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute.

1. Operating hardware shall be located between 34 and 44 inches above the floor to comply with requirements of the 2019 California Building Code and the 2010 ADA Standards for Accessible Design.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Thresholds: Set thresholds for exterior doors in a full bed of butyl-rubber sealant, secure to concrete substrates with 1/4 inch diameter stainless steel flat head sleeve anchors equally spaced not more than 12 inches on center and not more than 3 inches from ends.

G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost to the owner.

3.3 FIELD QUALITY CONTROL

A. Supplier’s Architectural Hardware Consultant (AHC), with installer present, shall inspect and test installed door hardware operation with the building’s climate control system at rest and in full operation. Architectural Hardware Consultant shall certify that hardware has been furnished and installed in accordance with the Contract Documents, manufacturer's instructions, as specified herein, and that door hardware operates as intended.

3.4 ADJUSTING

A. General: Adjust door latches and closers with heating and ventilating equipment fans in operation in order to compensate for room-to-room or room-to-exterior air pressure differences.

B. Door Closers: Adjust door closers so that the effort to operate doors shall not exceed 5 pounds for non-fire rated doors and 15 pounds maximum for fire rated doors; the force shall be the push/pull effort applied at right angles to hinged doors. (2019 CBC 11B-404.2.9). Adjust the sweep period for closers so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch (2019 CBC 11B-404.2.8.1).

C. Initial Adjustment: Approximately 2 weeks prior to completion or occupancy, adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate freely and smoothly as intended for the application installed.

D. Occupancy Adjustment and Service: Approximately six months after the completion of the project, the Contractor, accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surface soiled by hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION AND TRAINING

A. Instruct Owner's Personnel to adjust, operate, and maintain door hardware and door hardware finishes during the final adjustment of hardware.

3.7 DOOR HARDWARE SETS

A. The items listed in the following Hardware Sets shall conform to the requirements of the foregoing specifications.

B. The Door Schedule on the Drawings indicates hardware sets for each door.

C. Abbreviations for Manufacturers:

IVE	=	Ives	Hinges
LCN	=	LCN	Door Closers
NGP	=	National Guard Products	Astragal
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
SCE	=	Schlage Electronics	Door Position switches.
IVE	=	Ives	Protection Plates, & Stops
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weatherstrip

D. Door Hardware Sets:

HW SET: 01

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112XY EPT	628	IVE
1	EA	MULLION	KR4954 X 2-154	689	VON
1	EA	PANIC HARDWARE	QEL-RX-35A-EO X 299	626	VON
1	EA	PANIC HARDWARE	QEL-RX-LX-35A-NL-OP X 299	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX (MULLION)	626	SCH
2	EA	PRIMUS CORE ONLY	20-740	626	SCH
2	EA	OFFSET DOOR PULL	8190HD-0	630	IVE
1	EA	MULLION SEAL	8780N	BLK	ZER
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	MOUNTING PLATE	4110-18	689	LCN
1	EA	MOUNTING PLATE	9540-18	689	LCN
1	EA	AUTO. OPERATOR	9542 REG	628	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	545A MSLA	AL	ZER
2	EA	ACTUATOR	INGRESS'R HARDWIRED	AL	WIK
2	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.
WIRE ACTUATORS THROUGH LX SWITCH IN EXIT DEVICE SO THE AUTO OPERATOR IS DISABLED WHEN DOORS ARE LOCKED.
PERIMETER SEALS BY DOOR MANUFACTURER.
OVERHEAD STOP ON DOOR LEAF WITH AUTO DOOR OPERATOR AND SIGN.

HW SET: 02

2	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	EA	EU STOREROOM LOCK	ND96TDEU-RX RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.

HW SET: 03

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND96TD RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	SET	SEALS	188 HEAD AND JAMBS		ZER

HW SET: 04

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE

HW SET: 05

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE

HW SET: 06

1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	CONTINUOUS HINGE	700	630	IVE
1	EA	CONTINUOUS HINGE	700 EPT	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	EU STOREROOM LOCK	LV9092TEU-RX 06A	626	SCH
1	EA	COORDINATOR	COR X FL X MB	628	IVE
1	EA		ASTRAGAL BY DOOR MANUFACTURER		
2	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	188 HEAD AND JAMBS		ZER
2	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	545A MSLA	AL	ZER
2	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.

HW SET: 07

2	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	EA	EU STOREROOM LOCK	ND96TDEU-RX RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.

HW SET: 08

2	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	EA	PANIC HARDWARE	AX-RX-98L E996L	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.

HW SET: 09

1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA		IC CYLINDER AS REQUIRED	626	SCH

BALANCE OF HARDWARE BY DOOR MANUFACTURER

HW SET: 10

2	EA	CONTINUOUS HINGE	112XY	628	IVE
1	EA	MULLION	KR4954 X 2-154	689	VON
1	EA	PANIC HARDWARE	AX35A-EO	626	VON
1	EA	PANIC HARDWARE	AX35A-NL-OP	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX (MULLION)	626	SCH
2	EA	PRIMUS CORE ONLY	20-740	626	SCH
2	EA	OFFSET DOOR PULL	8190HD-0	630	IVE
1	EA	MULLION SEAL	8780N	BLK	ZER
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	MOUNTING PLATE	4110-18	689	LCN
2	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	545A MSLA	AL	ZER
2	EA	DOOR POSITION SWITCH	679-05		SCE

PERIMETER SEALS BY DOOR MANUFACTURER

HW SET: 11

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB41P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	COORDINATOR	COR X FL X MB	628	IVE
1	EA	ASTRAGAL	570 572 574 AS REQ'D	630	NGP
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	OVERHEAD STOP	100S	630	GLY
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE

HW SET: 12

2	EA	CONTINUOUS HINGE	700	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	LV9480T 06A	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	COORDINATOR	COR X FL X MB	628	IVE
1	EA		ASTRAGAL BY DOOR MANUFACTURER		
2	EA	SURFACE CLOSER	4111 H-EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
1	SET	SEALS	188 HEAD AND JAMBS		ZER
2	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	545A MSLA	AL	ZER
2	EA	DOOR POSITION SWITCH	679-05		SCE

HW SET: 13

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB41P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STORE LOCK	ND66TD RHO	626	SCH
2	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	COORDINATOR	COR X FL X MB	628	IVE
1	EA	ASTRAGAL	570 572 574 AS REQ'D	630	NGP
2	EA	SURFACE CLOSER	4111 H-EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	WALL STOP	WS401/402CCV	626	IVE
1	SET	SEALS	188 HEAD AND JAMBS		ZER

HW SET: 14

2	EA	CONTINUOUS HINGE	700	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	LV9480T 06A	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	COORDINATOR	COR X FL X MB	628	IVE
1	EA		ASTRAGAL BY DOOR MANUFACTURER		
2	EA	SURFACE CLOSER	4111 H-EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
1	SET	SEALS	188 HEAD AND JAMBS		ZER
2	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	545A MSLA	AL	ZER
2	EA	DOOR POSITION SWITCH	679-05		SCE

LHR ACTIVE

HW SET: 15

2	EA	POWER TRANSFER	EPT-10	689	VON
2	EA	CONTINUOUS HINGE	112XY EPT	628	IVE
1	EA	MULLION	KR4954 X 2-154	689	VON
1	EA	PANIC HARDWARE	QEL-RX-35A-EO X 299	626	VON
1	EA	PANIC HARDWARE	QEL-RX-35A-NL-OP X 299	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX (MULLION)	626	SCH
2	EA	PRIMUS CORE ONLY	20-740	626	SCH
2	EA	OFFSET DOOR PULL	8190HD-0	630	IVE
1	EA	MULLION SEAL	8780N	BLK	ZER
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	MOUNTING PLATE	4110-18	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	545A MSLA	AL	ZER
2	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.
PERIMETER SEALS BY DOOR MANUFACTURER
OVERHEAD STOP ON DOOR LEAF THAT SWINGS TOWARD SIGN

HW SET: 16

2	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	EA	EU STOREROOM LOCK	ND96TDEU-RX RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.

HW SET: 17

1	EA	POWER TRANSFER	EPT-10	689	VON
1	EA	CONTINUOUS HINGE	700	630	IVE
1	EA	CONTINUOUS HINGE	700 EPT	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	EU STOREROOM LOCK	LV9092TEU-RX 06A	626	SCH
1	EA	COORDINATOR	COR X FL X MB	628	IVE
1	EA		ASTRAGAL BY DOOR MANUFACTURER		
2	EA	SURFACE CLOSER	4111 SCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	188 HEAD AND JAMBS		ZER
2	EA	DOOR SWEEP	39A	AL	ZER
1	EA	THRESHOLD	545A MSLA	AL	ZER
2	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.

HW SET: 18

2	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	EA	EU STOREROOM LOCK	ND96TDEU-RX RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.

HW SET: 19

2	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	EA	PANIC HARDWARE	AX-RX-98L E996L	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOOR POSITION SWITCH	679-05		SCE

DOORS NORMALLY CLOSED AND LOCKED. DOOR UNLOCKED BY VALID CARD READER OR PROGRAMMED TIME UNLOCK. FREE EGRESS AT ALL TIMES.

HW SET: 20

6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB41P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	COORDINATOR	COR X FL X MB	628	IVE
1	EA	ASTRAGAL	570 572 574 AS REQ'D	630	NGP
2	EA	SURFACE CLOSER	4011	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE

HW SET: 21

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	PRIMUS CORE ONLY	20-740	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW	630	IVE
1	EA	DOME STOP	FS438 435 436 437 AS REQU'D	626	IVE

END OF SECTION

SECTION 087113
AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Low-energy door operators for swinging doors.
2. Power door actuation devices and accessories.

B. Related Requirements:

1. Division 08 Section "Hollow Metal Doors and Frames."
2. Division 08 Section “Flush Wood Doors.”
3. Division 08 Section “Door Hardware” for door hardware other than automatic door operators.
4. Division 26 Sections as applicable to requirements for electrical power supply and distribution.

1.3 REFERENCES AND DEFINITIONS

A. References:

1. AAADM: American Association of Automatic Door Manufacturers.
2. ADA: Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design.
3. BHMA: Builders' Hardware Manufacturers Association.
4. CCR: California Code of Regulations, Title 24, Part 2, California Building Code.

B. Definitions:

1. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
2. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
3. For automatic door terminology, see BHMA A156.19 for definitions of terms.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For automatic door operators.

1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Indicate locations of activation and safety devices.
4. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For automatic door operators, safety devices, and control systems, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project.

1.8 COORDINATION

A. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.

B. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.

C. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies and access-control system.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty or sporadic operation of automatic door operator, including controls.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.

2. Warranty Period: Two years from date of Substantial Completion.

1.10 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 LOW-ENERGY DOOR OPERATORS

A. Standard: BHMA A156.19.

B. Fire-Door Package: Consisting of UL-listed latch mechanism, power-reset box, and caution signage for fire-rated doors. Latch mechanism shall allow door to swing free during automatic operation; when fire is detected, latch actuator shall cause exit hardware to latch when door closes. Provide latch actuators with fail-secure design.

C. Performance Requirements:

1. 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.
2. Fire-Rated Doors: Where door operators are installed on fire rated door assemblies, provide door operators that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
3. Standby Power: Standby power required by California Building Code Section 11B-404.3.2 due to operator being used at a door that does not meet door maneuvering clearance requirements per CBC 11B-404.2.4.

4. Opening Force if Power Fails: Not more than 15 lbf required to release latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
5. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Basis-of-Design Product: Drawings and Specifications are based on the following:

1. xxxxx

a. Subject to compliance with requirements, provide product indicated or a comparable product by one of the following:

1) Besam Entrance Solutions; ASSA ABLOY.
2) Door Motion Technologies, Inc.
3) DORMA Americas.
4) Horton Automatics; a division of Overhead Door Corporation.
5) Hunter Automatics Inc.
6) KM Systems, Inc.
7) LCN; an Allegion brand.
8) NABCO Entrances, Inc.
9) SARGENT Manufacturing Company; ASSA ABLOY.
10) Stanley Access Technologies.

E. Low Energy Door Operators: Electrohydraulic, self-contained, low-pressure unit; with separate cylinders for power and checking, connections for power and activation and safety-device wiring, and manual operation including spring closing when power is off.

1. Configuration: Operator to control single swinging door with one way traffic pattern.
2. Operator Mounting: Surface.
3. Microprocessor Control Unit: Solid-state controller.
4. Power Supply: Powered by continuously charged 24V DC battery system; battery charging system power supplied by 120 VAC single phase; 60 Hz on a dedicated 15 amp circuit. Battery power shall be capable of providing a minimum of 100 cycles (open and close is one cycle) in the event of a building power failure.
5. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch thick, extruded or formed aluminum of manufacturer's standard width; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
6. Exposed Finish: Manufacturer’s standard finish, color as selected by Architect.

a. Finish to match standard hardware finish specified in Division 07 Section “Door Hardware.”

7. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.
8. Features:

a. Adjustable opening and closing speed.
b. Adjustable opening and closing force.
c. Adjustable backcheck.
d. Adjustable hold-open time from zero to 30 seconds.
e. Adjustable time delay.
f. Adjustable acceleration.
g. Obstruction recycle.
h. On-off/hold-open switch to control electric power to operator[**; key operated**].

F. Electrical Interlocks: Provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted. Coordinate interlocks with latching hardware.

G. Hinges: As indicated in Division 08 Section “Door Hardware” for hinge type for each door that door operator shall accommodate.

H. Activation: Momentary contact switch.

2.2 LOW-ENERGY DOOR OPERATORS

A. Standard: BHMA A156.19.

B. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.

C. Configuration: Operator to control single swinging door.

1. Traffic Pattern: One way.
2. Operator Mounting: Surface.

D. Configuration: Operator to control pair of swinging doors.

1. Traffic Pattern: **One way** [**Two way**] [**Double egress**] [**Double swing**].
2. Mounting: [**Surface**] [**Overhead concealed**].

E. Operating System: Electrohydraulic.

F. Microprocessor Control Unit: Solid-state controller.

G. Features:

1. Adjustable opening and closing speed.
2. Adjustable opening and closing force.
3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.

6. Adjustable acceleration.
7. Obstruction recycle.
8. On-off/hold-open switch to control electric power to operator[**; key operated**].

H. Activation Device: Vertical actuation bar located at each side of door to activate door operator.

I. Exposed Finish: [**Class I, clear anodic finish**] [**Class II, clear anodic finish**] [**Class I, color anodic finish**] [**Class II, color anodic finish**] [**Baked-enamel or powder-coat finish**] [**Finish matching door hardware**].

1. Color: [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Black**] [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from full range of industry colors and color densities**] **<Insert color>**.

2.3 POWER-ASSIST DOOR OPERATORS

A. Standard: BHMA A156.19.

B. Performance Requirements:

1. Opening Force:

a. Opening Force if Power Fails: Not more than 15 lbf required to release latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
b. Accessible Interior Doors: Not more than 5 lbf to push or pull door to fully open position.

2. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.

C. Configuration: Operator to control single swinging door.

1. Traffic Pattern: One way.
2. Operator Mounting: Surface..

D. Configuration: Operator to control pair of swinging doors.

1. Traffic Pattern: **One way** [**Double egress**] [**Double swing**].
2. Mounting: Surface.

E. Operation: Power-assisted opening that reduces the force to open door and[**power-assisted**] spring closing. Pushing or pulling on door activates operator. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.

F. Operating System: [**Electromechanical**] [**Electrohydraulic**] [**Pneumatic**].

G. Microprocessor Control Unit: Solid-state controller.

H. Features:

1. Adjustable [**opening**] [**and**] [**closing**] speed.
2. Adjustable [**opening**] [**and**] [**closing**] force.
3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.
6. Adjustable acceleration.
7. Obstruction recycle.
8. On-off/hold-open switch to control electric power to operator[**; key operated**].
9. **<Insert feature>**.

I. Exposed Finish: [**Class I, clear anodic finish**] [**Class II, clear anodic finish**] [**Class I, color anodic finish**] [**Class II, color anodic finish**] [**Baked-enamel or powder-coat finish**] [**Metal cladding**] [**Finish matching door and frame**] [**Finish matching door hardware**] **<Insert finish>**.

1. Color: [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Black**] [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from full range of industry colors and color densities**] **<Insert color>**.

2. Metal Cladding: [**No. 4, directional-satin-finish stainless steel**] [**No. 8, mirrorlike-reflective, nondirectional-polish-finish stainless steel**] [**Satin brass**] [**Polished brass**] [**Satin bronze**] [**Polished bronze**] **<Insert finish>**.

2.4 ACTIVATION DEVICES

A. General: Provide activation devices according to BHMA standards for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.

1. Activation devices shall be provided at both sides of doors.

B. Vertical Activation Bar: Momentary-contact door control switch with vertical push-plate actuator with contrasting-colored, engraved message.

1. Configuration: Vertical activation bar with 4-by-4-inch junction box.
2. Mounting: Surface mounted on wall or bollard as indicated on Drawings.
3. Size: 6 inches wide by 36 inches high by 1-1/2 inches deep, nominal dimensions; operational activation bar shall be full height and 2 inches minimum in width.
4. Identification/Message: The operational push bar shall display and be identified by an International Symbol of Accessibility complying with California Building Code Section 11B-703.7 and include the message “Push to Open.”

C. Wireless or Remote Radio-Control Switch: Radio-control system consisting of header-mounted receiver and **wall-mounted, battery-operated,** transmitter switch.

1. Wall-Mounted Transmitter Switch: One red-button, momentary-contact actuator enclosed in 4-by-4-inch junction box. Provide blue plastic cover engraved with "Press Button to Open" in white text and with international symbol of accessibility.

D. Electrical Interlocks: Provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.5 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated; extrusions: ASTM B 221; sheet: ASTM B 209.

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness, in manufacturer's standard thickness.

C. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.

B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Door Operators: Install automatic door operators according to manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.

B. Activation Devices: Install activation devices according to manufacturer's written instructions, California Building Code requirements, and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring according to applicable Division 26 Electrical Sections.

1. Location: Locate activation devices at each side of doors having power operators. Activation devices shall be located in conspicuous locations and shall be centered on a 30 inch by 48 inch wheelchair clear ground space that adjoins

an accessible route and is located outside of the swing of the door (CBC 11B-404.2.9).

2. Mounting Height: Mount vertical activation bars with the bottom of the bar 5 inches maximum above the floor or ground surface and the top at 35 inches maximum above the floor or ground surface (CBC 11B-404.2.9).

C. Signage: Apply on both sides of each door as required by California Building Code Chapter 11B and cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections **with the assistance of a factory-authorized service representative**:

1. Test and inspect each automatic door operator installation, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.

B. Automatic door operators will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.

1. Adjust operators on exterior doors for weathertight closure.

B. After completing installation of automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.

C. Readjust automatic door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

D. Occupancy Adjustment: When requested within [**12**] **<Insert number>** months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to [**two**] **<Insert number>** visits to Project during other-than-normal occupancy hours for this purpose.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include [**three**] [**six**] [**nine**] [**12**] months' full maintenance by skilled employees of automatic door operator Installer. Include [**monthly**] [**quarterly**] preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting

as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION

SECTION 088000
GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Glass for windows, doors, curtainwall, storefront framing and other locations where indicated.

a. Glass Types are indicated in glass type schedules at the end of this Section.

2. Glazing sealants and accessories.

B. Related Sections include the following:

1. Division 08 Section "Aluminum Windows” for installation of glass in factory-assembled window units.
2. Division 08 Section "Fire Resistant Glazing" for fire rated glass and glazing.

1.3 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 C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 SUBMITTALS

A. Product Data: For each type of product; include statement of VOC content for any adhesives or sealants.

B. Glass Samples: For each type of glass product, other than clear monolithic glass, in 12-inch square samples for the following:

1. Tinted glass.
2. Coated glass

3. Insulating glass.

C. Glazing Accessory Samples: For sealants and colored spacers in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in installations with a record of successful in-service performance; and who employs glass installers for this Project who are experienced in installing glazing similar in material, design, and extent to that indicated for this Project.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

1.6 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 FIELD 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 liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. 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. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. 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. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Where products are identified by manufacturer and product names, Design, Drawings, and Specifications are based on the product indicated; subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Guardian Industries.
2. Oldcastle Building Envelope.
3. Pilkington Building Products North America.
4. Vitro Architectural Glass (Formerly PPG Industries, Inc.)
5. Viracon, Inc.

B. Source Limitations for Glass: Obtain glass from a single source from a single manufacturer for each glass type.

1. Obtain tinted glass from a single source from a single manufacturer.
2. Obtain reflective-coated glass from a single source from a single manufacturer.

C. Source Limitations for Glazing Accessories: Obtain accessories from a single source from a single manufacturer for each product and installation method.

2.2 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. California Code of Regulations, Title 24, Part 6, California Energy Code.

1. NFRC 100: Procedure for Determining Fenestration Product U-factors."
2. NFRC 200 Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence."
3. NFRC 400: Procedure for Determining Fenestration Product Air Leakage."

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the California Building Code and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.
2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 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.

2.3 GLASS PRODUCTS, GENERAL

A. 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.

1. GANA Publication: "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Identification: Where safety glazing is indicated, each pane of safety glazing shall be identified by a manufacturer's designation specifying who applied the

designation, the manufacturer or installer and the safety glazing standard with which it complies, as well as the information specified in CBC Section 2403.1. The designation shall be acid etched, sand blasted, ceramic fired, laser etched, embossed, or of a type that once applied cannot be removed without being destroyed. A label meeting the requirements of CBC Section 2406.3 shall be permitted in lieu of the manufacturer's designation.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class I (clear), Quality-Q3.

B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

E. Reflective-Coated Vision Glass: ASTM C 1376.

F. Ceramic-Coated Spandrel Glass: ASTM C1048, Type I, Condition B, Quality-Q3.

G. Silicone-Coated Spandrel Glass: ASTM C1048, Type I, Condition C, Quality-Q3.

H. Reflective-Coated Spandrel Glass: ASTM C1376, Kind CS.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary seals.

2. Spacer: Manufacturer's standard spacer material and construction, aluminum with mill or clear anodic finish.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

B. Glass: Comply with applicable requirements in Part 3 Article "Insulating Glass Schedule."

1. Provide Kind HS (Heat-strengthened) or Kind FT (Fully tempered) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.

2.6 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Compatible with one another and with other materials they 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.
2. 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.
3. VOC Content: Field applied sealants shall have a VOC content of not more than 250 g/L.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 790.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. Tremco Incorporated; Spectrem 1.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating 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 C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. 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.

2.8 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: Type recommended by sealant or glass manufacturer; EPDM, Silicone, Neoprene, or Santoprene; with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Type recommended by sealant or glass manufacturer; neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Type recommended by sealant or glass manufacturer; EPDM, Silicone, Neoprene, or Santoprene; with a Shore A durometer hardness per manufacturer’s written instructions.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 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.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

    a. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 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. 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.

C. Apply primers to joint surfaces where required for adhesion of sealants.

D. 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.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lights.

F. Provide spacers for glass lights 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 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.

G. 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.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 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.

E. Do not remove release paper from tape until immediately 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.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 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.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lights and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. 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.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. 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.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

3.8 MONOLITHIC GLASS SCHEDULE

A. Glass Type CG: Clear float glass.

1. Thickness: 6.0 mm.

B. Glass Type TG: Clear fully tempered float glass.

1. Thickness: 6.0 mm.
2. Safety glazing required.

C. Glass Type RG: Reflective coated vision glass, fully tempered float glass.

1. Basis of Design : Vitro; Solarcool.
2. Coating Color: Silver
3. Thickness: 6.0 mm.
4. Coating Location: Second surface.
5. Safety glazing required.

D. Glass Type SG: Ceramic coated spandrel glass, fully tempered float glass.

1. Basis of Design : Vitro; Spandrel
2. Coating Color: As selected by the Architect
3. Thickness: 6.0 mm.
4. Coating Location: Second surface.
5. Safety glazing required.

E. Glass Type SG: Silicone-coated spandrel glass, fully tempered float glass.

1. Basis of Design : Industrial Control Development, Inc / Opaci-Coat 300]
2. Coating Color: As selected by the Architect
3. Thickness: 6.0 mm.
4. Coating Location: Third surface.
5. Safety glazing required.

3.9 INSULATING-GLASS SCHEDULE

A. Glass Type IG-1: Low-e coated, clear insulating glass.

1. Overall Unit Thickness: 1-inch (25mm).
2. Minimum Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Clear annealed float glass.
4. Indoor Lite: Clear annealed float glass.
5. Interspace Content: Clean-Dry-Air.
6. Low-E Coating: Pyrolytic or sputtered on second surface.
7. Visible transmittance: 62 Percent
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.31 maximum.

10. Solar Heat Gain Coefficient: 0.27.

B. Glass Type IG-2: Low-e and reflective coated, clear, fully tempered insulating glass.

1. Overall Unit Thickness: 1-inch (25mm).
2. Minimum Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Clear, fully tempered float glass.
4. Indoor Lite: Clear, fully tempered float glass.
5. Interspace Content: Clean-Dry-Air.
6. Low-E Coating: Pyrolytic or sputtered on third surface.
7. Reflective Coating: Pyrolytic or sputtered on second surface.
8. Visible transmittance: 35 Percent
9. Winter Nighttime U-Factor: 0.29 maximum.
10. Summer Daytime U-Factor: .31 maximum.
11. Solar Heat Gain Coefficient: 0.27.
12. Provide safety glazing labeling.

C. Glass Type SG-1: Spandrel coated, clear insulating glass.

1. Overall Unit Thickness: 1-inch (25mm).
2. Minimum Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Clear annealed float glass.
4. Indoor Lite: Clear annealed float glass.
5. Interspace Content: Clean-Dry-Air.
6. Spandrel Coating: Roller or spray-applied on third surface.
7. Visible transmittance: 0 Percent
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: .31 maximum.
10. Provide safety glazing labeling where required.

END OF SECTION

SECTION 088716
SAFETY AND SECURITY WINDOW FILM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Safety and security window film.
2. Film attachment systems.

B. Related Sections

1. Division 08 Section “Glazing” for glass and glazing.
2. Division 08 Sections as related to frames and framing for windows.

1.3 REFERENCES

A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.

B. ASTM International (ASTM):

1. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
2. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers -- Tension.
3. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
4. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
5. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
6. ASTM D 2240 - Standard Method for Rubber Property - Durometer Hardness.
7. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
8. ASTM D 5895 - Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.
9. ASTM D 4830 - Standard Test Methods for Characterizing Thermoplastic Fabrics Used in Roofing and Waterproofing.

10. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
11. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.
12. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
13. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
14. ASTM F1642 - Standard Method of Test for Glazing and Glazing Systems Subject to Airblast Loadings
15. ASTM F2912 - Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings

C. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

D. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.

E. GSA-TS01-2003 -- Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.

F. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.

G. Underwriters Laboratories Inc. (UL): UL 972 - Burglary Resisting Glazing Material.

1.4 SUBMITTALS

A. Product Data: For each product to be incorporated into the Work, include the following:

1. Manufacturer's written instructions for evaluating, preparing, and treating substrate surfaces.
2. Storage and handling requirements and recommendations.
3. Manufacturer's written instructions for installation methods.

B. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

C. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.

D. Performance Submittals: Provide laboratory data of emissivity and calculated window U-Factors for various outdoor temperatures based upon established calculation procedure defined by the ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.

E. Qualification Data: For installer.

F. Maintenance Data: For maintenance data to include in maintenance manuals.

G. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for installation of products specified in this Section and who has a record of successful in-service performance of not less than the last five consecutive years.

1. Provide a reference list of 5 commercial building properties where the installer has applied window film within the last three consecutive years. This list shall include the following information:

   a. Name of building and location (street address, city, state).
   b. The name and telephone number of a management contact.
   c. Type of glass.
   d. Type of film.
   e. Amount of film installed.
   f. Date of completion.

2. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film Manufacturer.

A. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build mockup as directed by Architect for typical installation, including accessories, to demonstrate surface preparation, installation procedures, edge terminations, and finished appearance.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 FIELD 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.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to furnish replacement window film material for window films that do not comply with requirements or that fail within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Installer's Warranty: Installers standard form in which Installer agrees to replace window films 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Surface burning characteristics when tested in accordance ASTM E 84 as follows:

1. Flame Spread Index: 25 or less.
2. Smoke Developed Index: 450 or less.

B. Abrasion Resistance: Film must have a surface coating that is resistant to abrasion such that, less than 5 percent increase of transmitted light haze will result in accordance with ASTM D 1044 using 50 cycles, 500 grams weight, and the CS10F Calbrase Wheel.

2.2 MANUFACTURERS

A. Basis of Design: In other Part 2 Articles where named manufacturer products are indicated, Drawings and Specifications are based on products manufactured by:

1. 3M Window Film.

a. Subject to compliance with requirements, provide product(s) indicated or comparable product(s) subject to Request for Substitution.

2.3 CLEAR MICROLAYERED SAFETY AND SECURITY WINDOW FILM

A. 3M Ultra S600: Optically clear micro-layered polyester film, with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film is clear and will not contain dyed polyester. Film contains at least forty-two micro-layers.

1. Physical / Mechanical Performance Properties:

a. Film Color: Clear.
b. Thickness: Nominal 6.0 mils (0.15 mm), comprised of 42 micro-layers.
c. Tensile Strength (ASTM D 882): 30,000 psi.
d. Break Strength (ASTM D 882) (Per Inch Width): 180 lbs.
e. Tear Resistance (ASTM D 1004): Greater than 1,150 lbs.
f. Puncture Propagation Tear (ASTM D 2582): 19.2 lbs.
g. Young's Modulus (ASTM D 882): 500 kpsi nominal.

2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission Across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.

5. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.

a. Visible Light Transmission (ASTM E 903): 84 percent.
b. Visible Reflection (ASTM E 903): Not more than 10 percent.
c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
d. Solar Heat Gain Coefficient (ASTM E 903): 0.78.

6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 mm) annealed glass.

a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.

7. Windstorm Protection: Film shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 50 psf Design Pressure with use of 3M Impact Protection Adhesive or 3M Impact Protection Profile attachment system.

8. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.

a. GSA Level 2 rating with minimum blast load of 14 psi overpressure and 70 psi*msec blast impulse.
b. GSA Level 3A rating with minimum blast load of 11 psi overpressure and 55 psi*msec blast impulse.
c. GSA Level 2 rating with minimum blast load of 10 psi overpressure and 89 psi*msec blast impulse.
d. ASTM F1642 "No Hazard" rating with minimum blast load of 6 psi overpressure and 41 psi*msec blast impulse
e. ASTM F1642 "Minimal Hazard" rating with minimum blast load of 10 psi overpressure and 89 psi*msec blast impulse

2.4 MICROLAYERED SAFETY AND SECURITY WINDOW FILM WITH SUN CONTROL

A. 3M Ultra Prestige PR S70: Optically clear polyester film comprised of 28 micro-layers, laminated to different clear multi-layered polyester film containing at least 220 layers with a pressure sensitive adhesive on one side and durable acrylic abrasion resistant coating on the other side. Films contain no metals, but so contain infrared-absorbing carbon, metal oxide particles, or both.

1. Physical / Mechanical Performance Properties:

   a. Film Color: Clear with at least 220 layers.
   b. Thickness: Nominal 6.0 mils (0.15 mm).
   c. Tensile Strength (ASTM D 882): 30,000 psi.
   d. Break Strength (ASTM D 882) (Per Inch Width): 120 lbs.
   e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
   f. Puncture Propagation Tear (ASTM D 2582): 7.5 lbs.
   g. Young's Modulus (ASTM D 882): 500 kpsi nominal.

2. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.

   a. Visible Light Transmission (ASTM E 903): 69 percent.
   b. Visible Reflection (ASTM E 903): Not more than 10 percent.
   c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
   d. Solar Heat Gain Coefficient (ASTM E 903): 0.50.
   e. TSER - 60 Degree Angle - 59 percent.

3. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
4. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
5. Identification: Labeled as to Manufacturer as listed in this Section.

6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 mm) annealed glass.

   a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
   b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.

7. Windstorm Protection:

   a. Safety film component shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 70 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.
   b. Safety film component shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 50 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.

8. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.

    a. GSA Level 2 rating with minimum blast load of 4 psi overpressure and 28 psi*msec blast impulse.
    b. GSA Level 3B rating with minimum blast load of 9 psi overpressure and 49 psi*msec blast impulse.

B. 3M Ultra Prestige PR S50: Optically clear polyester film comprised of 28 micro-layers, laminated to different clear multi-layered polyester film containing at least 220 layers with a pressure sensitive adhesive on one side and durable acrylic abrasion resistant coating on the other side. Films contain no metals, but so contain infrared-absorbing carbon, metal oxide particles, or both.

1. Physical / Mechanical Performance Properties:

    a. Film Color: Clear with at least 220 layers.
    b. Thickness: Nominal 6.0 mils (0.15 mm).
    c. Tensile Strength (ASTM D 882): 30,000 psi.
    d. Break Strength (ASTM D 882) (Per Inch Width): 120 lbs.
    e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
    f. Puncture Propagation Tear (ASTM D 2582): 7.5 lbs.
    g. Young's Modulus (ASTM D 882): 500 kpsi nominal.

2. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.

    a. Visible Light Transmission (ASTM E 903): 50 percent.
    b. Visible Reflection (ASTM E 903): Not more than 8 percent.
    c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
    d. Solar Heat Gain Coefficient (ASTM E 903): 0.44.
    e. TSER - 60 Degree Angle - 63 percent.

3. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
4. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
5. Identification: Labeled as to Manufacturer as listed in this Section.

6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 mm) annealed glass.

    a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
    b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.

7. Windstorm Protection:

    a. Safety film component shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at 70 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.

b. Safety film component shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at 50 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.

8. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.

a. GSA Rating with minimum blast pressure and impulse of 4 psi and 28 psi.msec, respectively (GSA blast level "C"): 3B.

C. 3M Ultra Neutral S35: Optically clear polyester film comprised of 28 micro-layers, laminated to a metalized multi-layered polyester film. Additional film layer is added for color and performance, with a durable abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film color is derived from the metal coating and the product will not contain dyed polyester.

1. Physical / Mechanical Performance Properties:

a. Film Color: Tinted - Derived from metal coatings.
b. Thickness: Nominal 6.0 mils (0.15 mm).
c. Tensile Strength (ASTM D 882): 30,000 psi.
d. Break Strength (ASTM D 882) (Per Inch Width): 120 lbs.
e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
f. Puncture Propagation Tear (ASTM D 2582): 7.5 lbs.
g. Young's Modulus (ASTM D 882): 500 kpsi nominal.

2. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.

a. Visible Light Transmission (ASTM E 903): 36 percent.
b. Visible Reflection (ASTM E 903): Not more than 20 percent.
c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
d. Solar Heat Gain Coefficient (ASTM E 903): 0.44.

3. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
4. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
5. Identification: Labeled as to Manufacturer as listed in this Section.

6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 mm) annealed glass.

a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.

7. Windstorm Protection:

a. Safety film component shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at

+/- 70 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.

b. Safety film component shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 50 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.

8. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.

    a. GSA Level 3B rating with minimum blast load of 4 psi overpressure and 37 psi*msec blast impulse

D. 3M Ultra Night Vision S25: Optically clear polyester film comprised of 28 micro-layers, laminated to a metalized polyester film. Additional film layer is added for color and performance, with a durable abrasion resistant coating over one surface and a pressure sensitive adhesive on the other. The film color is derived from the metal coating and the product will not contain dyed polyester.

1. Film Type: Ultra NV S25.
2. Physical / Mechanical Performance Properties:

    a. Film Color: Tinted - Derived from metal coatings.
    b. Thickness: Nominal 6.0 mils (0.15 mm).
    c. Tensile Strength (ASTM D 882): 30,000 psi.
    d. Break Strength (ASTM D 882) (Per Inch Width): 120 lbs.
    e. Tear Resistance (ASTM D 1004): Greater than 780 lbs.
    f. Puncture Propagation Tear (ASTM D 2582): 7.5 lbs.
    g. Young's Modulus (ASTM D 882): 500 kpsi nominal.

3. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.

    a. Visible Light Transmission (ASTM E 903): 27 percent.
    b. Visible Reflection (ASTM E 903): Not more than 28 percent.
    c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
    d. Solar Heat Gain Coefficient (ASTM E 903): 0.38.

4. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
5. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
6. Identification: Labeled as to Manufacturer as listed in this Section.

7. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 mm) annealed glass.

    a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
    b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.

8. Windstorm Protection:

a. Safety film component shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTM E 1996 and E 1886) at +/- 70 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.
b. Safety film component shall pass impact of Small Missile "A" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 50 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.

9. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.

a. GSA Level 2 rating with minimum blast load of 4 psi overpressure and 28 psi*msec blast impulse.
b. GSA Level 3B rating with minimum blast load of 9 psi overpressure and 49 psi*msec blast impulse.

2.5 CLEAR SAFETY AND SECURITY WINDOW FILM

A. 3M Safety S40 (SH4CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.

1. Physical / Mechanical Performance Properties:

a. Film Color: Clear.
b. Thickness: Nominal 4.0 mils (0.10 mm).
c. Tensile Strength (ASTM D 882): 25,000 psi.
d. Elongation: 130 percent.
e. Break Strength (ASTM D 882) (Per Inch Width): 100 lbs.

2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.

5. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.

a. Visible Light Transmission (ASTM E 903): 87 percent.
b. Visible Reflection (ASTM E 903): Not more than 10 percent.
c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
d. Solar Heat Gain Coefficient (ASTM E 903): 0.82.

6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 mm) annealed glass.

a. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).

b. Safety Rating (ANSI Z97.1): Class B, Unlimited Size.

B. 3M Safety S70 (SH7CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.

1. Physical / Mechanical Performance Properties:

a. Film Color: Clear.
b. Thickness: Nominal 7.0 mils (0.18 mm).
c. Tensile Strength (ASTM D 882): 25,000 psi.
d. Break Strength (ASTM D 882) (Per Inch Width): 175 lbs.

2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.

5. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.

a. Visible Light Transmission (ASTM E 903): 86 percent.
b. Visible Reflection (ASTM E 903): Not more than 10 percent.
c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
d. Solar Heat Gain Coefficient (ASTM E 903): 0.79.

6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 mm) annealed glass.

a. Safety Rating (CPSC 16 CFR, Part 1201): Category I (150 ft.-lbs).

7. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.

a. GSA level 3B rating with minimum blast load of 17 psi pressure and 89 psi*msec blast impulse.

C. 3M Safety S80 (SH8CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.

1. Physical / Mechanical Performance Properties:

a. Film Color: Clear.
b. Thickness: Nominal 8.0 mils (0.20 mm).
c. Tensile Strength (ASTM D 882): 25,000 psi.
d. Break Strength (ASTM D 882) (Per Inch Width): 200 lbs.

2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.

5. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.

    a. Visible Light Transmission (ASTM E 903): 86 percent.
    b. Visible Reflection (ASTM E 903): Not more than 10 percent.
    c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
    d. Solar Heat Gain Coefficient (ASTM E 903): 0.79.

6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 mm) annealed glass.

    a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
    b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.

7. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.

    a. GSA level 2 rating with minimum blast load of 12 psi overpressure and 66 psi*msec blast impulse.
    b. GSA level 3B rating with minimum blast load of 14 psi overpressure and 60 psi*msec blast impulse.

D. 3M Safety S140 (SH14CLARL): Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.

1. Physical / Mechanical Performance Properties:

    a. Film Color: Clear.
    b. Thickness: Nominal 14.0 mils (0.36 mm).
    c. Tensile Strength (ASTM D 882): 25,000 psi.
    d. Break Strength (ASTM D 882) (Per Inch Width): 350 lbs.

2. Uniformity: No noticeable pin holes, streaks, thin spots, scratches, banding or other optical defects.
3. Variation in Total Transmission across the Width: Less than 2 percent over the average at any portion along the length.
4. Identification: Labeled as to Manufacturer as listed in this Section.

5. Solar Performance Properties: Film applied to 1/4 Inch (6.4 mm) thick clear glass.

    a. Visible Light Transmission (ASTM E 903): 85 percent.
    b. Visible Reflection (ASTM E 903): Not more than 10 percent.

c. Ultraviolet Transmission (ASTM E 903): Less than 1 percent.
d. Solar Heat Gain Coefficient (ASTM E 903): 0.78.

6. Impact Resistance for Safety Glazing: Tested on 1/4 inch (6.4 mm) annealed glass.

a. Safety Rating (CPSC 16 CFR, Part 1201): Category II (400 ft.-lbs).
b. Safety Rating (ANSI Z97.1): Class A, Unlimited Size.

7. Windstorm Protection

a. Film shall pass impact of Medium Large Missile "C" and withstand subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 50 psf Design Pressure with use of 3M Impact Protection Adhesive attachment system.

8. Bomb Blast Mitigation: Independent testing with results from high explosive arena blast testing.

a. GSA level 3B rating with minimum blast load of 12 psi overpressure and 66 psi*msec blast impulse.
b. GSA level 3B rating with minimum blast load of 15 psi overpressure and 58 psi*msec blast impulse.

9. Forced Entry Protection: Independent lab testing according to UL 972 protocol (Multiple Impact Test).

a. Annealed Glass (1/4 inch) - Pass
b. Tempered Glass (1/4 inch) - Pass

2.6 3M IMPACT PROTECTION FILM ATTACHMENT SYSTEMS

A. 3M Impact Protection Adhesive (IPA): Weatherable, UV-resistant, moisture curable structural sealant wet glaze.

1. Color:

a. Black.
b. White.

2. Material Properties (as supplied):

a. Typical Cure Time: 3 - 7 days (25 degreesC, 50% RH)
b. Full Adhesion: 7 - 14 days
c. Tack-Free Time (ASTM D 5895): 21 minutes (25 degreesC, 50% RH)
d. Flow, Sag or Slump (ASTM D 2202): 0 inches
e. Specific Gravity: 1.4
f. Working Time: 10 - 20 minutes (25 degreesC, 50% RH)
g. VOC Content: 16 g/L

3. Material Properties (as cured - 21 days at 25 degreesC, 50% RH):

a. Ultimate Tensile Strength (ASTM D412): 380 psi (2.62 MPa)
b. Ultimate Elongation (ASTM D412): 640 psi
c. Durometer Hardness, Shore A (ASTM D2240): 38-39 points
d. Tear Strength, Die B (ASTM D624): 72 ppi

4. Uniformity: Product shall have uniform consistency and appearance, with no clumping.
5. Flammability: Class A Interior Finish for Building Materials.
6. Windborne Debris Protection:

    a. As part of a filmed glass system, film attachment shall demonstrate ability to withstand Medium Large Missile C and Small Missile A impact, with subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 70 psf design pressure.
    b. As part of a filmed glass system, film attachment shall demonstrate ability withstand structural load requirements of ASTM E330 when tested at +/ 120 psf design pressure.

7. Bomb Blast Mitigation:

    a. GSA level "2" rating (minimal hazard) of "2" with minimum blast load of 11 psi overpressure and 55 psi*msec blast impulse.
    b. GSA level "3B" rating (low hazard) with minimum blast load of 10 psi overpressure and 89 psi*msec blast impulse.
    c. ASTM F1642 rating of "Low Hazard" with minimum blast load of 8 psi overpressure and 42 psi*msec blast impulse.

B. 3M Impact Protection Profile (IPP): Weatherable, flexible-mechanical style film attachment made of extruded rubber profile with two strips of double coated foam tape: one strip for bonding to applied film and the other strip for bonding to the window frame.

1. 3M Impact Protection Profile, BP-700.

    a. Total width: 1.0 inches.
    b. Tape width: 0.5 inches.

2. 3M Impact Protection Profile, BP-950.

    a. Total width: 1.3 inches.
    b. Tape width: 0.625 inches.

3. Material Properties:

    a. Full Adhesion: 1 - 2 days (25 degreesC, 50% RH)
    b. Ultimate Tensile Strength (ASTM D412): > 20,500 psi
    c. Ultimate Elongation (ASTM D412): 400%
    d. Break Strength, Die B (ASTM D624): > 71 ppi
    e. Durometer Hardness, Shore A: (ASTM D2240): 70 pts

4. Uniformity: Product shall have uniform consistency and appearance.

5. Flammability: Class A Interior Finish for Buildings.
6. Windborne Debris Protection:

    a. As part of a filmed glass system, film attachment shall demonstrate ability to withstand Small Missile A impact, with subsequent pressure cycling (per ASTMs E 1996 and E 1886) at +/- 50 psf design pressure.

7. Bomb Blast Mitigation:

    a. GSA level "2" rating (minimal hazard) with minimum blast load of 4 psi overpressure and 28 psi*msec blast impulse.
    b. GSA level "3B" rating (low hazard) with minimum blast load of 10 psi overpressure and 89 psi*msec blast impulse.
    c. ASTM F1642 rating of "Low Hazard" with minimum blast load of 4 psi overpressure and 28 psi*msec blast impulse.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of safety and security window film.

1. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
3. Commencement of installation constitutes acceptance of conditions.

B. Impact Protection Adhesive Examination:

1. Filmed glass surfaces receiving new attachment should first be examined to verify that they are free from defects and imperfections, and that the film edges extend sufficiently to the frame edges.
2. Do not proceed with installation until film and frame surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
3. Upon the Owner’s request, an adhesion test to the frame surface may be conducted by applying a 4 - 6 inch long bead, approximately 0.5 - 1 inch in width, masking one side of the frame surface underneath the strip with tape. Allow the Impact Protection Adhesive to cure for 7 days and test adhesion by pulling up on the masked end at a 90 degree angle. If cohesive failure is observed (adhesive residue left behind on the frame surface), adhesion is acceptable; if adhesive failure is observed (clean peel from the frame), adhesion is unacceptable and product is not recommended.

C. Impact Protection Profile Examination:

1. Windows and frames must be examined to ensure that they are fit to receive the Impact Protection Profile in a manner such that the two profile adhesive strips will be perpendicularly opposed to each other and that they will not contact glazing stops or frame gaskets without stretching the profile.
2. Filmed glass surfaces receiving new attachment should first be examined to verify that they are free from defects and imperfections, and that the film edges extend sufficiently to the frame edges.
3. Do not proceed with installation until film and frame surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
4. Upon the Owner's request, an adhesion test to the frame surface may be conducted by applying a 4 - 6 inch long strip on the frame surface, using the sufficient pressure to achieve good adhesive wet-out. Allow the Impact Protection Profile to cure for 1-2 days and test adhesion by removing the test strip. If cohesive failure is observed (adhesive residue left behind on the frame surface), adhesion is acceptable; if adhesive failure is observed (clean peel from the frame), adhesion is unacceptable and product is either not recommended, or an adhesion promoter, such as 3M Primer 94, must be used.

3.2 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.

C. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.3 INSTALLATION

A. Film Installation:

1. Install in accordance with manufacturer's instructions.
2. Window Film shall be applied to exterior window glazing that is at an elevation of +12’-0” and below.
3. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
4. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
5. Apply film to glass and lightly spray film with slip solution.
6. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
7. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.

8. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

B. Impact Protection Adhesive Installation:

1. The film attachment system shall be applied according to the specifications of the Manufacturer by an Authorized Dealer/Applicator. Refer to 3M publication, 70-0709-0322-7, 3M Impact Protection Adhesive Attachment System Installation Instructions.

    a. For blast mitigation: minimum 1/2 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).
    b. For windborne debris protection: minimum 3/8 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).

2. To ensure a straight and consistent bead width is achieved, masking tape may be applied to film and frame surfaces prior to application.
3. With prior approval of the building owner or property manager, existing compression gaskets may be partially removed or trimmed to allow for a thinner bead and stronger anchorage. If removing the gaskets, sections shall be trimmed approximately 3 inches in length and inserted with appropriate spacing along all sides of the window to help secure the glazing during application and curing of the Impact Protection Adhesive.
4. The Impact Protection Adhesive shall be dispensed with a caulk gun with nozzle opening diameter sized to match the approximate size of the desired bead width.
5. A plastic putty knife or other tool with a clean straight edge shall be used to trowel and smooth out the adhesive. The completed adhesive bead shall be relatively triangular in shape.
6. Any masking tape used shall be carefully removed within 10 minutes after applying the wet glaze.

C. Impact Protection Profile Installation:

1. The film attachment system shall be applied according to the specifications of the Manufacturer by an Authorized Dealer/Applicator trained to install 3M Impact Protection Profile. Refer to 3M publication, 70-0709-0323-5, 3M Impact Protection Profile Attachment System Installation Instructions.
2. Each profile piece must span continuously to both sides of the window, within 1/8 inch to the frame edge. Splicing the profile between frame edges is prohibited.
3. Profile must be aligned and applied by 3M recommended or approved methods and tools to ensure a quality installation.
4. Corner joints must be fabricated by 3M recommended and approved methods. No part of the profile adhesive shall make contact with an adjacent profile.
5. Sufficient pressure must be evenly applied along the entire length of the profile to ensure full adhesion from both adhesive strips. A roller tool is required to minimize entrapment of air in the adhesive.

3.4 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior walls, ceilings, and soffits.
2. Acoustic isolators.

B. Related Sections:

1. Division 03 Section “Post Installed Concrete Anchors” for anchors in concrete and/or masonry.
2. Division 05 Section "Cold-Formed Metal Framing" for general metal framing for exterior walls and interior load bearing conditions.
3. Division 09 Section “Non-structural Metal Framing” for non-load-bearing, general metal framing.
4. Division 09 Section “Gypsum Board” for gypsum board attached to steel framing systems.
5. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include manufacturer’s written installation procedures and details.

1. Provide documentation that stud and track members are certified in accordance with the product certification program of the Steel Framing Industry Association (SFIA) or a similar organization that provides a verifiable code compliance program.

B. Evaluation Reports: From ICC-ES or IAPMO ES, or certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 accreditation criteria, for the following:

1. Metal framing.
2. Post installed concrete anchors.
3. Powder-actuated fasteners.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Use adequate number of skilled workmen who are thoroughly trained and experienced in the installation of non-structural metal framing and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect non-structural metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing." Cover stored metal framing with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 MANUFACTURERS

A. Source Limitations: Obtain metal framing systems for a single source from a single manufacturer.

B. Manufacturers: Subject to compliance with requirements, provide non-structural metal framing by one of the following:

1. California Expanded Metal Products Company.
2. ClarkDietrich.
3. MarinoWare; a Division of Ware Industries.
4. SCAFCO Corp.

2.3 NON-LOAD-BEARING STEEL FRAMING SYSTEMS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Framing Members General: Comply with AISI S220 and ASTM C 645, Section 10 and Steel Stud Manufacturers Association (SSMA), Product Technical Information, ESR-4064P, or the Steel Framing Industry Association (SFIA) Technical Guide for conditions indicated.

1. Steel Sheet Components: Comply with AISI S220 requirements for metal, unless otherwise indicated.
2. Protective Coating: Comply with AISI S220, ASTM A653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.

C. Steel Studs, Joists, and Track: AISI S220 and ASTM C 645, Section 10, of minimum base metal thickness and size as indicated on the Drawings.

1. Joists shall be un-punched.

D. Slip-Type Head Joints: Slip type head joints shall be as indicated on Drawings, where not indicated on Drawings, provide one of the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-inch minimum vertical movement.
2. Single Long-Leg Track System: ASTM C645 top track with 2-inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
3. Double-Track System: ASTM C645 top outer tracks, inside track with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs. Subject to compliance with requirements, provide one of the following:

    a. Dietrich Metal Framing; SLP-TRK.
    b. Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
    c. Superior Metal Trim; Superior Flex Track System (SFT).

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs. Subject to compliance with requirements, provide one of the following:

1. Dietrich Metal Framing; SLP-TRK.
2. Fire Trak Corp.; Fire Trak
3. Metal-Lite, Inc.; The System.

F. Backing Plate: Steel sheet for blocking and bracing in size and thickness indicated on Drawings, 0.0312-inch thick (20 gauge) minimum.

G. Flat Strapping: 1-1/2 inch wide by 0.0296-inch thick (20 gauge) flat steel strapping unless otherwise indicated on Drawings.

H. Cold-Rolled Channels for Bridging and Furring: Steel, 0.0538-inch bare-steel thickness, with minimum 1/2-inch wide flanges.

1. Depth: 3/4-inch or 1-1/2-inch as required for project conditions, otherwise indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.0538-inch thick, galvanized steel.

I. Hat-Shaped, Rigid Furring Channels: AISI S220 of size and metal thickness as indicated on the Drawings, 0.0312-inch thick (20 gauge) minimum thickness.

J. Resilient Furring Channels: 1/2-inch deep, asymmetrical shaped, steel sheet members designed to reduce sound transmission.

K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

B. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power and other properties required to fasten steel members to substrates.

C. Post-installed Concrete Anchors: Fabricated from corrosion-resistant materials; manufacturer, size, and type as indicated on Drawings and specified in Division 03 Section “Post Installed Concrete Anchors.”

D. Isolation Strip at Exterior Walls: Provide adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

E. Acoustic Isolators: Specialty connectors and fittings to isolate vibration and control sound transmission. Approved manufacturer: Mason Industries, Inc.

1. Vertical Assemblies:

a. Wall Base Isolator: NPS (neoprene partition support).
b. Wall Stud Sway Brace: WIC

2. Horizontal Assemblies:

a. Spring-loaded Ceiling Hanger: 30NCC

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF FRAMING

A. Install framing components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated. Comply with the following installation standards:

1. ASTM C754.
2. ASTM C 840 as applicable to metal framing systems for gypsum board.
3. ICC or IAPMO Engineering Report for metal framing system.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

F. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

G. Install studs and joists so flanges within framing system point in same direction.

H. Install tracks at floors and tops of walls as indicated on Drawings.

1. Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies. Provide slip-type head joints as indicated on the Drawings, or if not indicated, by one of the following methods:

a. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
b. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, outside runner fastened to overhead structure and sized

to friction fit inside runner with not less than 1 inch overlap of flanges and providing not less than 1 inch vertical deflection.

c. Deflection type top track.

I. Door Openings: Frame door openings as indicated on Drawings; install not less than two studs at each jamb, unless otherwise indicated. Extend jamb studs to the structure above, where jamb studs do not extend to the structure above, provide diagonal bracing perpendicular to the wall and located directly above jamb studs and fasten bracing to the structure above. Screw vertical studs at jambs to jamb anchor clips on door frames.

J. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

K. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure. Frame top of wall condition as indicated on Drawings to maintain continuity of fire-resistance-rated assembly indicated.

L. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

M. Z-Furring Members:

1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches on center.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall as indicated on Drawings with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches on center.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

N. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

O. Sound and Vibration Isolators: Install each component type where indicated on Drawings in accordance with manufacturer’s written recommendations.

END OF SECTION

SECTION 092900
GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.
3. Auxiliary and acoustical materials

B. Related Sections:

1. Division 05 Section "Cold-Formed Metal Framing" for load-bearing steel framing that supports gypsum board.
2. Division 06 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
3. Division 06 Section "Sheathing" for exterior gypsum sheathing.
4. Division 07 Section "Blanket Insulation" for batt and blanket insulation installed in assemblies that incorporate gypsum board.
5. Division 07 Section "Penetration Firestopping" for head-of-wall assemblies that incorporate gypsum board.
6. Division 09 Section "Non-Structural Metal Framing" for non-structural framing that supports gypsum board.
7. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
8. Division 09 Section “Painting” for primers applied to gypsum board surfaces.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer’s product data for each type of product indicated or incorporated into the Work.

1. Include statement of VOC content for any adhesives or sealants.

B. Samples for Verification: For the following:

1. Textured Finishes: Three (3) 48-inch square samples for each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, build mockups to demonstrate aesthetic effects and set quality standards for materials and execution. Mockups shall be installed at locations as directed by architect, shall include full walls where practical, and shall not be less than 100 square feet in area.

1. Build mockups to demonstrate the following:

    a. Each level of gypsum board finish indicated for use in exposed locations.
    b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper faced gypsum panels 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

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD 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.

1. Width: 4 feet.
2. Length: 8, 10, or 12 feet.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Gypsum Co.
2. Georgia-Pacific Gypsum, LLC.
3. Lafarge North America Inc.
4. National Gypsum Company.
5. PABCO Gypsum.
6. USG Corporation.

B. Interior Gypsum Wallboard: ASTM C 1396/C 1396M of the following types:

1. Regular Type:
    a. Thickness: 5/8 inch.
    b. Long Edges: Tapered.
2. Type X:
    a. Thickness: 5/8 inch.
    b. Long Edges: Tapered.
3. Moisture and Mold-Resistant Type: With moisture and mold-resistant core and surfaces.
    a. Core: 5/8 inch, Type X.
    b. Long Edges: Tapered.
    c. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide products by one of the following:

    a. CertainTeed Corp.; FiberCement BackerBoard.
    b. Custom Building Products; Wonderboard.
    c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
    d. James Hardie Building Products, Inc.; Hardiebacker.
    e. National Gypsum Company, Permabase Cement Board.
    f. USG Corporation; DUROCK Cement Board.

2. Thickness: 5/8 inch.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes: As required for project conditions, including but not limited to the following:

    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. L-Bead: L-shaped; exposed long flange receives joint compound.
    d. U-Bead: J-shaped; exposed short flange does not receive joint compound.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated on Drawings.

1. Basis of Design Manufacturer: Drawings and Specifications are based on products manufactured by:

    a. The Fry Reglet Corporation.

        1) Subject to compliance with requirements, provide products indicated or equivalent products by one of the following:

            a) Gordon, Inc.
            b) Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Class II clear anodic finish.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Pre-filling: At open joints 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 drying-type, all-purpose compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels: As recommended by backing panel manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick (20 gage structural and heavier).

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
3. Use screws complying with ASTM C 954 for fastening all panel typess to wood framing.

D. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

1. Sealants shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Insulation: As specified in Division 07 Section "Blanket Insulation."

F. Mass-loaded Vinyl Sound Barrier: A high-temperature, unreinforced fused vinyl, limp-mass membrane installed to enhance STC values of wall and ceiling assemblies.

1. Acceptable Product: AudioSeal® Sound Barrier; Acoustical Solutions.

2. Thickness: 1/8 inch and ¼ inch.
3. Roll Width: 48 inches and 54 inches.
4. Weight: 1 lb/sq.ft. and 2 lb/sq.ft.

2.8 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

1. Coordinate primers with Division 09 Section “Painting.”

B. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.

1. Texture: Light spatter.

C. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.

1. Texture: Orange Peel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

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.

3.2 INSTALLING ACOUSTICAL BOARD PANELS

A. Install panels in accordance with manufacturer’s written installation instructions.

B. Locate ends and edges over framing members, blocking, or solid backing.

C. Fasten panels to supports with screws.

3.3 APPLYING AND FINISHING GYPSUM PANELS, GENERAL

A. Comply with ASTM C 840 and manufacturer’s written installation instructions.

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 sq. ft. 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. Fastening Gypsum Board Panels: Comply with fastening requirements of ASTM C 840 unless more stringent fastening requirements are required for fire resistance rated gypsum board assemblies as indicated on Drawings. Fasten gypsum panels to supports with steel drill screws as follows:

1. Fastener Spacing, Single Layer Gypsum Board Application:

   a. Ceilings: Space fasteners 12 inches on center maximum.
   b. Walls: Space fasteners 12 inches on center maximum where studs are spaced 24 inches on center; fastener spacing may be increased to 16 inches on center where studs are spaced 16 inches on center.
   c. Edge Distance: Space fasteners 3/8 inches minimum from panel edges.

2. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3. Attachment to Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

4. Where gypsum panels are installed over structural sheathing or acoustical board panels, increase the length of fasteners an amount equal to not less than the thickness of the sheathing or panels.

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 C 919 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.

J. Coordinate gypsum panel installation with insulation work specified in Division 07 Section “Blanket Insulation.”

1. Thermal and sound attenuation batt/blanket insulation shall be installed before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side of framing members.

3.4 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: Unless otherwise indicated.

2. Regular Type: At vertical and horizontal surfaces, unless otherwise indicated.
3. Type X: Where required for fire-resistance-rated assemblies.
4. Moisture and Mold-Resistant Type: At walls of toilet and janitor rooms, walls within 2 feet (horizontally) of plumbing fixtures, and other locations as indicated on Drawings.

B. 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 vertically (parallel to framing) using continuous panels without abutting end joints unless otherwise indicated or required by fire-resistance-rated design.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls where the vertical dimension of the wall without horizontal offsets exceeds the maximum available panel length, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated design.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
4. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

C. Multi-layer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers parallel to framing members, as required for single layer application, 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.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws or as required for fire resistance rated design.

3.5 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, provide panels of matching thickness or shim surfaces to produce a uniform plane across panel surfaces.

3.6 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 at locations indicated on Drawings and according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use at exposed panel edges where LC-Bead cannot be used.
4. U-Bead: Use where indicated.

D. Aluminum Trim: Install at locations indicated on Drawings.

3.7 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. Pre-fill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840 and the Gypsum Association:

1. Level 1: All joints and interior angles shall have tape embedded in joint compound; surface shall be free of excess joint compound; tool marks and ridges are acceptable.

    a. Locations: Concealed areas and areas above ceilings.

2. Level 2: All joints and interior angles shall have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories; surface shall be free of excess joint compound; tool marks and ridges are acceptable.

    a. Locations: Panels that are substrate for applied rigid panels having a thickness not less than 3/8 inches.

3. Level 3: All joints and interior angles shall have tape embedded in joint compound and two (2) separate coats of joint compound applied over all joints, angles, fastener heads, and accessories; all joint compound shall be smooth and free of tool marks and ridges.

    a. Locations: Not used unless otherwise indicated on Drawings.

4. Level 4: All joints and interior angles shall have tape embedded in joint compound and Three (3) separate coats of joint compound applied over all joints, angles, fastener heads, and accessories; all joint compound shall be smooth and free of tool marks and ridges.

    a. Locations: At panel surfaces that will be exposed to view and painted or will be substrates for wall coverings.
    b. Primer and its application to surfaces are specified in Division 09 Section “Painting.”
    c. Where suspended ceilings are to be installed, wall finish shall extend not less than 6 inches above the ceiling height.

5. Level 5: All joints and interior angles shall have tape embedded in joint compound and Three (3) separate coats of joint compound applied over all joints, angles, fastener heads, and accessories; a thin skim coat of joint compound or similar material specific for this purpose shall be applied to the entire surface; the surface shall be smooth and free of tool marks and ridges.

    a. Locations: Not used unless otherwise indicated on Drawings
    b. Primer and its application to surfaces are specified in Division 09 Section “Painting.”

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes prior to application of finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.9 INSTALLING AUXILARY MATERIALS

A. Mass-loaded Vinyl Sound Barrier: Install where indicated and in the thickness and manner shown on Drawings, whether direct-to-studs or between gypsum board panels, and in accordance with manufacturer’s written instructions. Provide fasteners and acoustical adhesives/sealants (“Green Glue”) as recommended by the manufacturer.

3.10 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. 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
TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Ceramic tile.
2. Metal edge strips.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
2. Division 07 Section “Joint Sealants” for sealing of expansion, contraction, and isolation joints in tile surfaces.
3. Division 09 Section "Portland Cement Plastering" for scratch coat for thickset mortar setting-bed installations.
4. Division 09 Section "Gypsum Board" for tile backing panels.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Face Size: Actual tile size, excluding spacer lugs.

D. Module Size: Actual tile size plus joint width indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

C. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain all tile of same type from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Joint sealants.
2. Metal edge strips.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Colors, Textures, and Patterns: Where selection of colors, surface textures, patterns, and other appearance characteristics are required, selections shall be made by Architect from manufacturer’s full range unless otherwise indicated.

2.3 TILE PRODUCTS

A. Basis-of-Design Manufacturer: Provide products indicated as manufactured by the following:

1. Dal-Tile International Corporation.
    a. Subject to compliance with requirements, provide products indicated or equal products by one of the following:
        1) Crossville Ceramics Company, L.P.

2) Florida Tile Industries, Inc.
3) Interceramic Tile.
4) Summitville Tiles, Inc.
5) United States Ceramic Tile Company.

B. Factory mounted unglazed ceramic mosaic floor tile:

1. Style Name: Daltile, Keystones Porcelain, Price Group 2.
2. Composition: Porcelain.
3. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
4. Module Size: 4-1/4 BY 4 1/4 inches.
5. Thickness: 1/4 inch.
6. Face: Plain with cushion edges.
7. Surface: Smooth, without abrasive admixture.
8. Dynamic Coefficient of Friction: Not less than 0.42.
9. Finish: Mat, opaque.
10. Tile Color and Pattern: As indicated on Drawings or if not indicated, as selected by Architect.
11. Grout Color: As indicated on Drawings or if not indicated, as selected by Architect.

C. Glazed Wall Tile:

1. Style Name: Daltile, Semi-Gloss or Matte.
2. Module Size: 12 BY 24 inches.
3. Thickness: 5/16 inch.
4. Face: Plain with cushion edges.
5. Finish: Bright, opaque; Mat, opaque; or Semimat, opaque glaze per tile as indicated on Drawings, or if not indicated, as selected by Architect from manufacturer's full range.
    a. Accent Tile Finish: Bright, opaque; Mat, opaque; or Semimatt, opaque glaze per tile as indicated on Drawings, or if not indicated, as selected by Architect from manufacturer's full range.
6. Tile Color and Pattern: As indicated on Drawings or if not indicated, as selected by Architect.
7. Grout Color: As indicated on Drawings or if not indicated, as selected by Architect.

D. Trim Units: Coordinated with sizes and coursing of adjoining tile where applicable and matching characteristics of adjoining tile indicated. Provide shapes as follows, selected from manufacturer's standard shapes:

1. Internal Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.4 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062 inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

B. Modified Dry-Set Mortar (Thin Set): ANSI A118.4.

1. Prepackaged dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.

   a. For wall applications, provide mortar that complies with requirements for non-sagging mortar in addition to the other requirements in ANSI A118.4.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Boiardi Products Corporation.
   b. Bonsal, W. R., Company.
   c. Custom Building Products.
   d. LATICRETE International Inc.
   e. MAPEI Corporation.
   f. Summitville Tiles, Inc.

2.5 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.

B. Standard Prepackaged Cement Grout: ANSI A118.6, color as indicated.

C. Polymer-Modified Prepackaged Tile Grout: ANSI A118.7.

2.6 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the applicable requirements in Division 07 Section "Joint Sealants."

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Grout Sealer: Product recommended by manufacturer for sealing grout joints that does not change color or appearance of grout.

1. Grout sealers shall comply with requirements of FloorScore certification.

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm, dry, clean, and free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

C. Where mortar bed installed tile floors are indicated, prepare substrates by applying a reinforced mortar bed that complies with ANSI A108.1A for use with or without a waterproof membrane, or A108B without a waterproof membrane.

1. Where tile floors are indicated to be sloped, slope 1/4 inch per foot maximum (2%) toward drains.

D. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Comply with TCNA's " Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

a. Exterior tile floors.
b. Tile floors in wet areas.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch.
2. Glazed Wall Tile: 1/16 inch.

H. Lay out tile wainscots to next full tile beyond dimensions indicated.

I. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

K. Grout Sealer: Apply grout sealer to grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other

surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.5 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 FLOOR TILE INSTALLATION SCHEDULE

A. Floor Tile Installation FT-1: Ceramic tile over mortar bed (thickset) bonded to concrete subfloor.

1. Installation Method: TCNA F112 and ANSI A108.1C, Unglazed ceramic mosaic tile over mortar bed (thickset) bonded to concrete subfloor.
2. Thin-Set Mortar: Latex-portland cement mortar.
3. Grout: Polymer-modified unsanded grout.

3.7 WALL TILE INSTALLATION SCHEDULE

A. Wall Tile Installation WT-1: Ceramic tile thinset over cementitious backer board.

1. Installation Method: TCNA W244C and ANSI A108.5, Glazed wall tile thinset over cementitious backer units.
2. Thin-Set Mortar: Latex-portland cement mortar.
3. Grout: Polymer-modified unsanded grout.

END OF SECTION

SECTION 095113
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

B. Related Requirements:

1. Division 07 Section “Joint Sealants” for acoustical joint sealant.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include statement of VOC content for any adhesives or sealants.

B. Samples for Initial Selection: For components with factory-applied finishes.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: 6-inch square samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch long Samples of each type, finish, and color.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.

a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.

5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:

    a. Lighting fixtures.
    b. Diffusers.
    c. Grilles.
    d. Speakers.
    e. Sprinklers.
    f. Access panels.
    g. Perimeter moldings.

7. Minimum Drawing Scale: 1/8 inch = 1 foot.

E. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

F. Maintenance Data: For finishes to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size panels equal to not less than 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to not less than 2 percent of quantity installed.

1.5 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.

1.6 FIELD 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.

1.7 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND REGULATORY REQUIREMENTS

A. Ceiling System Components: Ceiling system components shall comply with ASTM C 635 and Section 5.1 of ASTM E 580.

B. Seismic Performance: Suspended ceiling systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the California Building Code.

C. Sustainability Requirements: Acoustical panels shall comply with the requirements of California Department of Public Health, “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers,” Version 1.2, January 2017 (Emissions testing method for California Specification 01350).

D. System components and installation shall comply with the following.

1. Ceiling System General Notes:

a. Ceiling system components shall comply with ASTM C 635 and Section 5.1 of ASTM E 580.
b. The ceiling grid system must be rated heavy duty as defined by ASTM C 635.
c. Suspension component manufacturer, product number, and Evaluation Report information provided in Part 2 Article “Metal Suspension Systems” of this Specification Section.
d. Ceiling panels shall not support any light fixtures, air terminals, or devices.
e. For acoustical panels of any material other than mineral or glass fiber, a 3/4 inch clearance shall be provided between the panel and the wall on the sides of the ceiling free to slip. Clearance between ceiling grid runners and walls shall comply with the details on these drawings regardless of ceiling panel material.

2. Materials:

a. Ceiling wire shall be Class 1 zinc coated (galvanized) carbon steel conforming to ASTM A 641. Wire shall be 12 gauge (0.106 inch diameter) with soft temper and minimum ultimate tensile strength of 70 ksi.
b. Galvanized sheet steel (including that used for metal stud compression struts) shall conform to ASTM A 653, or other equivalent sheet steel listed in Section A3.1 of the North American Specification for the Design of Cold-

Formed Steel Structural Members (AISI S100). Material 43 mil (18 gauge) thick and lighter shall have a minimum yield strength of 33 ksi. Material 54 mil (16 gauge) thick and heavier shall have a minimum yield strength of 50 ksi.

c. Electrical metallic tubing (EMT) shall conform to ANSI C80.3/UL 797 carbon steel with G90 galvanizing. EMT shall have a minimum yield strength (Fy) of 30 ksi and minimum ultimate strength (Fu) of 48 ksi.

3. Attachment of Hanger and Bracing Wires:

   a. All ceiling hanger and bracing wires shall be separated at least 6 inches from all unbraced ducts, pipes, conduits, etc.
   b. Hanger and bracing wires shall not attach to or bend around obstructions including but not limited to piping, ductwork, conduit, and equipment.
   c. Hanger wires that are more than one horizontal in 6 vertical out of plumb shall have counter sloping wires.
   d. Slack Safety wires shall be considered hanger wires for installation and testing requirements.
   e. Hanger and brace wire anchorage to the structure shall be installed in such that the direction of the anchorage aligns with the direction of the wire. Screws in wood shall be installed to align with the direction of the wire.

4. Fasteners and Welding:

   a. Sheet metal screws shall comply with ASTM C 1513 ASME B 18.6.3. Penetration of screws through joined material shall not be less than three exposed threads.
   b. Expansion anchors shall be as indicated on Drawings including manufacturer, product, engineering service report number, and test load for each size specified.
   c. Power actuated fasteners shall be as indicated on Drawings including manufacturer, product, and engineering service report number.
   d. If not otherwise specified in the evaluation report, power actuated fasteners installed in steel shall be installed so the entire pointed end of the fastener is driven through the steel member.
   e. Power actuated fasteners in concrete or masonry are not permitted for bracing wires.
   f. Concrete reinforcement and prestressing tendons shall be located by non-destructive means prior to installing post-installed anchors.
   g. Welding shall be in accordance with AWS D1.3 using E60XX series electrodes.

5. Testing:

   a. All field testing must be performed in the presence of the project inspector.

6. Luminaires / Light Fixtures:

   a. All light fixtures shall be positively attached to the ceiling suspension system by mechanical means to resist a horizontal force equal the weight

of the fixture. A minimum of two screws or approved fasteners are required at each light fixture per ASTM E 580, Section 5.3.1.

b. Surface mounted fixtures shall be attached to the main runner with at least 2 positive clamping devices. The clamping device shall completely surround the supporting ceiling runner and be made of steel with a minimum thickness of 14 gauge. Rotational spring catches are not permitted. A 12 gauge slack safety wire shall be connected from each clamping device to the structure above. Additional supports shall be provided when a light fixtures is 8 feet or longer or exceed 56 lbs. Maximum spacing between supports shall not exceed 8 feet.

c. Light fixtures weighing less than or equal to 10 lbs supported directly on the ceiling runners shall have a minimum of one 12 gauge slack safety wire connected from the fixture hosing to the the structure above.

d. Light fixtures weighing greater than 10 lbs, but less than or equal to 56 lbs supported directly on the ceiling grid members shall have a minimum of two (2) 12 gauge slack safety wires connected from the fixture housing at diagonal corners to the structure above.

    1) Exception: All light fixtures greater than 2 by 4 ft weighing less than 56 lbs shall have a 12 gauge slack safety wire at each corner.

e. All light fixtures weighing greater than 56 lbs shall be independently supported from the structure above. See support details on Drawings for additional information.

7. Services within the Ceiling:

    a. Ceiling mounted services weighing less than or equal to 20 lbs shall have one 12 gauge slack safety wire attached from the terminal or service to the structure above.

    b. Ceiling mounted services weighing more than 20 pounds but less than or equal to 56 pounds shall have two 12 gauge slack safety wires (at diagonal corners) connected from the terminal or service to the structure above.

    c. Ceiling mounted services weighing more than 56 pounds shall be independently supported from the structure above. See support details on theses Drawings for additional information.

8. Other Devices within the Ceiling:

    a. All lightweight miscellaneous devices, such as strobe lights, occupancy sensors, speakers, exit signs, etc., shall be attached to the ceiling grid. Devices weighing more than 10 lbs shall have a 12 gauge slack safety wire anchored to the structure above. Devices weighing more than 20 lbs shall be independently supported from the structure above.

2.2 ACOUSTICAL PANELS

A. Source Limitations, Acoustical Ceiling Panels: Obtain acoustical panels from a single source from a single manufacturer.

B. Manufacturer, Basis-of-Design Products: Where named manufacturer’s products are indicated, Drawings and Specifications are based on products manufactured by:

1. Armstrong World Industries, Inc.

a. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:

1) BPB USA.
2) CertainTeed Corp.
3) USG Interiors, Inc.; Subsidiary of USG Corporation.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

D. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

E. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances 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 according to ASTM E 795.

F. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: 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 D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

G. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

H. Acoustical Panel Types:

1. Type ACP-1: Armstrong World Industries; Cortega, No. 769.

a. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
b. Pattern: Medium fissured (ASTM E1264 pattern C D).
c. Size: 24 x 48 x 5/8 inches.
d. Edge: Square.
e. Color: White.
f. LR: Not less than 0.82.
g. NRC: Not less than 0.55.

2.3 METAL SUSPENSION SYSTEMS

A. Source Limitations, Suspension Systems: Obtain suspensions systems from a single source from a single manufacturer.

B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M, and Section 5.1 of ASTM E580.

1. Main runners, cross runners, splices, expansion devices, and intersection connectors shall be designed to carry a mean ultimate test load of not less than 180 lbs in compression and tension per ASTM E 580 Section 5.1.2.

C. Wide-Face, Capped, Double-Web Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 15/16-inch wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted white.
6. Basis of Design: Design, Drawings, and Specifications are based on the following:

    a. Armstrong World Industries, Prelude XL (ESR-1308).

        1) Main Runners: No. 7301.
        2) Cross Runners: No. XL7341 (4’), XL7328 (2’).
        3) Perimeter Seismic Clips: No. BERC2.

    b. Design is based on a ceiling system using proprietary perimeter seismic clips and approved by DSA; substitutions will require a Substitution Request and processing a DSA Construction Change Document.

D. Edge Moldings and Trim: Manufacturer's standard roll formed sheet metal angle edge molding and trim with hemmed edges having nominal 7/8 inch legs, that fit acoustical panel edge details and suspension systems indicated, and 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.

1. Perimeter Seismic Clips: Provide manufacturer’s proprietary perimeter seismic clips at ends of main and cross runners at wall angles to comply with seismic standards indicated.
2. 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.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.4 ACCESSORIES

A. Attachment Devices: As indicated on Drawings; attachment devices to be sized for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Power-Actuated Fasteners in Steel: Fasteners as indicated on Drawings fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

   1. Power actuated fasteners installed in steel shall be installed so the pointed end of the fastener is driven through the steel member unless otherwise indicated in the evaluation report.

C. Sheet Metal Screws: Comply with ASTM C1513-10, ASME B18.6.4-89 (R2005). Penetration of screws through joined material shall be not less than three exposed threads.

D. Hanger and Brace Wires: Class 1 zinc-coated (galvanized) carbon-steel wire conforming to ASTM A 641-09a; wire to be 12 gauge (0.106 inch diameter) with soft temper and minimum tensile strength of not less than 70 ksi.

E. Seismic Struts: Metal stud sections of size indicated on Drawings of galvanized steel sheet conforming to ASTM A653-11, or other equivalent sheet steel listed in Section A2.1 of the North American Specification for the Design of Cold-Formed Steel Structural Members 2007, including supplement 2 dated 2010 (AISI S100-07/S2-10). Material 43 mil (18 gauge) and lighter shall have a minimum yield strength of 33 ksi; material 54 mil (16 gauge) and heavier shall have a minimum yield strength of 50 ksi.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

2.5 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Division 07 Section “Joint Sealants." Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

   1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
   2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
   3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 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. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M, Section 5.2 of ASTM E 580, and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

3.4 INSTALLATION OF HANGER AND BRACE WIRES

A. Anchors and/or Clips for Hanger and Brace Wires: Anchors and/or Clips for hanger and brace wires shall be installed in such a manner that the direction of the anchor/clip aligns as closely as possible with the direction of the wire.

B. Hanger Wires: Suspend ceiling hanger wires from the building's structural members and attach to grid members as indicated on Drawings and as follows:

1. Install hanger wires spaced not more than 4 feet on center along main runners and not more than 8 inches from ends of runners at the perimeter of the ceiling.
2. Install hanger wires at cross runners at the perimeter of the ceiling area not more than 8 inches from edges or one-fourth the length of the runner whichever is least. Perimeter wires are not required when the length of the runner is 8 inches or less.
3. Install hanger wires plumb and free from contact with insulation or other objects within the space above the ceiling that are not part of supporting structure or of ceiling suspension system. Hanger wires shall be separated from unbraced pipes, ducts, conduits, and similar items a minimum of 6 inches.

4. Secure hanger wires to ceiling suspension grid members and to supports above with a minimum of three tight turns in 3 inches. Hanger wire loops shall be tightly wrapped and sharply bent to prevent any vertical movement or rotation of the member within the loops.
5. Hanger wires shall not attach to or bend around interfering material or equipment. Provide trapeze or other supplementary support members at obstructions to typical hanger spacing.
6. Provide additional hangers, struts, or braces as required at all ceiling breaks, soffits, or discontinuous areas.
7. Splay hanger wires only where required to miss obstructions; hanger wires that are more than one horizontal to 6 vertical out of plumb shall have counter sloping wires. Counter sloping wires are not required at perimeter hanger wires at main runners that are positively attached to the perimeter wall closure angle.

C. Seismic Bracing/Hanger Wires and Compression Struts: Seismic bracing shall consist of a compression strut and sets of 4 splayed brace wires oriented 90 degrees from each other attached to suspension grid main runners and the structure above as indicated on Drawings and as follows:

1. Space bracing assemblies not more than 12 feet on center each way and not more than 6 feet from walls.
2. Secure brace wires to ceiling suspension main runners and to building structural members above with a minimum of four tight turns in 1-1/2 inches.

    a. Brace wires shall attach to main runners within 2 inches of the intersection of main and cross runners.
    b. The slope of brace wires shall not exceed 45 degrees from the plane of the ceiling.
    c. Brace wires shall be separated from unbraced pipes, ducts, conduits, and similar items a minimum of 6 inches.

3. Compression struts shall attach to ceiling grid main runners at the intersection of the brace wires and shall be installed not more than 1 horizontal to 6 vertical out of plumb.
4. Ceiling areas of 144 square feet or less surrounded by walls attached or braced to the structure above shall not require seismic bracing.
5. Ceiling areas of 1,000 square feet or less surrounded by walls attached or braced to the structure above shall not require seismic bracing.

    a. Free floating ceilings (Ceilings not entirely surrounded by walls on all sides) shall be seismically braced regardless of area.

3.5 INSTALLATION OF GRID MEMBERS AND WALL TRIM

A. Edge Molding and Trim: Install trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Positively attach trim to the wall as indicated on Drawings.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 24 inches on center 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.

B. Suspension Grid Members: Install suspension grid members so they are level, square, and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

1. Install grid members to form standard 2 foot x 4 foot grid layout as indicated on Drawings.

a. Main runners shall be spaced 4 feet on center and shall be supported by hanger wires spaced not more than 4 feet on center along the main runner.
b. 4 foot long cross runners shall be installed perpendicular to main runners and spaced 24 inches on center.
c. 2 foot long cross runners shall be installed perpendicular to the 4 foot cross runners at the mid-point of the 4 foot cross runners.

2. Grid members shall be attached to metal wall angle trim two adjacent walls per ASTM E 580, Section 5.2.3; grid members shall be at least 3/4 inches clear of other walls.

a. Proprietary seismic clips shall be installed at each grid member at walls of the ceiling area where grid members are not connected to the adjacent wall angle trim; seismic clips shall be securely fastened to the wall; seismic clips shall allow the grid member 3/4 inch movement in compression and in tension.

3. Expansion joints shall be provided between grid members at the intersections of corridors and at the junctions of corridors and lobbies or similar areas.

3.6 INSTALLATION OF ACOUSTIC CEILING PANELS

A. Acoustic Panels: 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 square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. Provide oversize penetrations through ceiling panels for sprinkler heads and similar rigid penetrating items that are not connected to the ceiling system; penetrations shall be 2 inches minimum oversized to allow for horizontal movement of 1 inch in all directions.

a. Penetrations shall be finished with escutcheons to seal off oversized openings; escutcheons shall allow for movement of 1 inch minimum in all directions

b. Flexible pipe penetrations shall not require oversize openings.

4. Arrange directionally patterned acoustical panels with pattern running in one direction.

3.7 INSTALLATION OF ACCESSORIES

A. Light Fixtures: All light fixtures shall be positively attached to the ceiling suspension system by mechanical means per CEC Article 410.36 to resist a horizontal force equal the weight of the fixture. A minimum of two screws or approved fasteners are required at each light fixture per ASTM E 580, Section 5.3.1.

1. Surface mounted fixtures shall be attached to the main runner with at least 2 positive clamping devices on each fixture; the clamping device shall completely surround the supporting ceiling runner and be made of 14 gauge minimum thickness sheet steel; rotational spring catches do not comply. A 12 gauge slack safety wire shall be attached to each clamping device and to the structure above. Provide additional supports when light fixtures are 8 feet or longer or exceed 56 lbs. Maximum spacing between supports shall not exceed 8 feet.
2. Light fixtures weighing not more than 10 lbs shall have a minimum of one 12 gauge slack safety wire connected to the fixture hosing and the structure above.
3. Light fixtures weighing more than 10 lbs, but not more than 56 lbs, may be supported directly on the ceiling grid members, but they shall have a minimum of two 12 gauge slack safety wires connected to the fixture housing at diagonal corners and anchored to the structure above. Light fixtures greater than 2 by 4 ft weighing less than 56 lbs shall have a 12 gauge slack safety wire at each corner.
4. Light fixtures weighing more than 56 lbs shall be independently supported by not less than 4 taut 12 gauge wires attached to the fixture housing, one at each corner, and the structure above; the 4 taut wires, including their attachment to the structure, must be capable of supporting 4 times the weight of the fixture.
5. Pendant mounted fixtures shall be supported directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting 2 times the weight of the fixture.

B. Air Terminals and Other Services: Ceiling mounted air terminals and/or other services shall be positively attached to the ceiling suspension system by mechanical means to resist a horizontal force equal to the weight of the component; screws or approved fasteners are required. A minimum of 2 attachment points are required at each component.

1. Ceiling mounted air terminals and/or other services weighing not more than 20 lbs shall have one 12 gauge slack safety wire attached to the terminal or service and the structure above.
2. Ceiling mounted air terminals and/or other services weighing more than 20 lbs, but not more than 56 lbs, shall have a minimum of two 12 gauge slack safety wires connected to the terminal or service and the structure above.
3. Ceiling mounted air terminals and/or other services weighing more than 56 lbs shall be independently supported by not less than 4 taut 12 gauge wires attached to the terminal or service and the structure above. The 4 taut wires including their

attachment to the structure must be capable of supporting 4 times the weight of the terminal or service.

4. Lightweight miscellaneous devices, such as strobe lights, occupancy sensors, speakers, exit signs, etc., shall be attached to the ceiling suspension system by mechanical means to resist a horizontal force equal to the weight of the component; screws or approved fasteners are required. A minimum of 2 attachment points are required at each component.

    a. Devices weighing more than 10 lbs, and not exceeding 20 lbs, shall have a minimum of one 12 gauge slack safety wire connected to the fixture hosing and the structure above.
    b. Devices weighing more than 20 lbs shall be independently supported by not less than 4 taut 12 gauge wires attached to the fixture and the structure above. The 4 taut wires including their attachment to the structure must be capable of supporting 4 times the weight of the fixture.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Tests and Inspections: Testing and inspecting of completed installations of acoustical panel ceiling hangers and anchors and fasteners shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements. Field testing shall be performed in the presence of the project inspector. Testing and inspecting shall be required for the following:

    1. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

C. Remove and replace hangers, anchors, and fasteners that do not pass tests and inspections and retest as specified above.

3.9 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 096001
FLOORING MOISTURE AND pH TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control for flooring moisture and pH testing of interior concrete slabs.

1. Owner will engage a qualified testing agency to perform tests and inspections.

B. Related Sections include the following:

1. Division 01 Section “Quality and Testing Requirements.”
2. Division 03 Section “Topical Concrete Vapor Control Barrier”
3. Division 09 Sections as applicable to adhered flooring materials.

1.3 REFERENCES

A. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor using Anhydrous Calcium Chloride.

B. ASTM F 710 Standard Practice for Preparing Concrete Floors to receive Resilient Flooring.

C. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.4 TESTING AGENCY

A. General: Owner will engage a qualified testing agency to conduct tests and inspections specified.

1. Costs for testing agency services will be paid by the Owner.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be paid by the Owner and the amount will be deducted from the Contract Sum by Change Order.

B. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Perform testing as required by the Contract Documents.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Taking all test specimens.
4. Prepare written reports of tests and inspections, and submit reports of each test, inspection, and similar quality-control service to Architect and Contractor.
5. Retesting and reinspecting corrected work.
6. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
7. Do not perform any duties of Contractor.

1.5 CONTRACTOR REQUIREMENTS

A. Contractor Responsibilities:

1. 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:

    a. Access to the Work.
    b. Incidental labor and facilities necessary to facilitate tests and inspections.

2. 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.

    a. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Testing shall not occur 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. Maintain ambient temperatures within range recommended by manufacturers of flooring products, but not less than 68 deg F or more than 80 deg F, in spaces to receive adhered flooring products during the following time periods:

    a. 48 hours before testing.
    b. During testing.
    c. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturers of flooring products, but not less than 68 deg F or more than 80 deg F.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. The following materials and equipment shall be the responsibility of the Owner's testing agency:

1. Test Kit as manufactured by American Moisture Test, Inc., Tramex, LTD.

a. ASTM F 1869 water vapor emission test.
b. ASTM F 2170 relative humidity test.
c. ASTM F 710 digital alkalinity-pH, wide range 1-14pH.

PART 3 - EXECUTION

3.1 PREPARATION

A. Contractor Responsibilities: Prepare concrete substrates according to ASTM F 710 and flooring manufacturers' written instructions to ensure adhesion of resilient products.

1. Verify that substrates are dry, free of curing compounds, sealers, and hardeners, and are compatible to receive adhesive applied flooring products.
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. Mechanically abrade and/or grind a 20 inch by 20 inch area to remove adhesives, paint, curing/sealing compounds, and similar residue a minimum of 24 hours prior to application of testing equipment at each test location for water vapor emission testing.

a. Do not abrade surface where topical concrete vapor control barriers have been applied; clean surface of contamination and directly apply testing equipment to treated surface(s) without scarification methods.

B. Temperature and Humidity: Maintain spaces at the temperature and humidity conditions anticipated during normal occupancy and as specified in Part 1 Article "Field Conditions" before, during, and after testing.

1. Testing shall be performed under HVAC controlled conditions, testing performed without HVAC controlled conditions shall be subject retesting prior to flooring application.

3.2 TESTING

A. Testing: Testing Agency shall perform tests as follows:

1. Anhydrous calcium chloride test, ASTM F 1869.

a. Do not mechanically abrade concrete surfaces that have been treated with a topical vapor control barrier.
b. Perform all gram scale weights on site.
c. Expose dome for 60 to 72 hours.
d. Report results as pounds of emission per 24 hours per ASTM F 1869.

1) Satisfactory results shall have a maximum moisture-vapor-emission rate of not more than 3 lb of water/1000 sq. ft. in 24 hours.

2. Relative humidity test using in situ probes, ASTM F 2170.

a. Test method not required for areas sealed with Topical Vapor Control Barrier.
b. Satisfactory results shall have a maximum 75 percent relative humidity level measurement.

3. Testing for pH:

a. Apply pH solution to form a 1-inch diameter circle directly to interior of moisture dome.
b. Allow to absorb into concrete for 1 minute.
c. Apply flat tip pH meter to solution and document result as required by manufacturer.

1) Satisfactory results shall be in the pH range 5 minimum to 9 maximum.

4. Frequency of Testing: Apply tests at a rate of three (3) test locations for areas up to 1,000 square feet and one (1) test per each 1,000 square feet thereafter. Note test location and number on next to test for future identification.

5. Do not proceed with flooring installation until satisfactory results are achieved or a topical vapor control barrier is applied.

3.3 REPAIR

A. General: On completion of testing, contractor shall repair damaged construction and restore substrates and finishes.

1. Use materials for patching identical to in-place materials; refer to applicable specification sections for materials and installation. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
2. Comply with the requirements Division 01 Section "Execution."

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.

D. Test Results shall be reported similar to the below American Moisture Test “Report 100”:

Interior Test Conditions	Relative Humidity (%)	Air Temp. (˚F)
Start of Test		
End of Test		
ASTM Requirement	50 ± 10 % RH	75 ± 10º F

Results	Moisture Vapor Emission Rate (MVER) / Relative Humidity	pH
Highest	/	
Lowest	/	
Acceptable	3.0 lbs. / 75% RH	9.0pH

Location	ASTM F-1869-04 Calcium Chloride Data							Results	
	Start Date/Time	End Date/Time	Elapsed Time	Start Weight	Ending Weight	Weight Gain	Concrete Surface Temp Start / End	Digital pH	MVER / Relative Humidity

END OF SECTION

SECTION 096513
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include statement of VOC content for any adhesives or sealants.

B. Samples for Initial Selection: For color and texture for each product indicated.

C. Product Schedule: For resilient products, use same designations as Contract Documents.

1.4 MAINTENANCE MATERIAL SUBMITTALS

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.

1.5 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 or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.
2. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
3. Roppe Corporation, USA.

B. Resilient Base: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style: Cove (base with toe).
2. Minimum Thickness: 0.125 inch.
3. Height: 4 inches unless otherwise indicated on Drawings.
4. Lengths: Cut lengths 48 inches long, or coils in manufacturer's standard length.
5. Outside Corners: Preformed.
6. Inside Corners: Job formed or preformed.
7. Colors: As selected by Architect from full range of industry colors.

2.2 RESILIENT MOLDING ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.
2. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
3. Roppe Corporation, USA.

B. Resilient Molding Accessories: Flooring terminations, transitions, reducer strips, and accessories as indicated and/or required for project conditions.

1. Material: Rubber.
2. Profile and Dimensions: As indicated in Drawings and/or as required for project conditions.
3. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 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. Adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Cove Base Adhesives: VOC content of not more than 50 g/L.
b. Rubber Floor and Stair Tread Adhesives: VOC content of not more than 60 g/L.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. 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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. 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.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 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. Outside Corners: Install preformed corners; install corners before installing straight pieces.

H. Inside Corners: Install preformed or job formed inside corners.

1. Preformed Corners: Install preformed corners before installing straight pieces.
2. Job-Formed Corners: Use straight pieces of maximum lengths possible and form returns with not than 6 inches in length, miter corners to minimize open joints.

3.4 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.

3.5 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.

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 subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 096519
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vinyl composition floor tile, Luxury Class.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for concrete floor substrates.
2. Division 03 Section "Topical Concrete Vapor Control Barrier."
3. Division 09 Section "Flooring Moisture and pH Testing."
4. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Documentation indicating resilient flooring complies with the pollution emission limits of at least one of the following:
    a. Resilient Floor Covering Institute (RFCI) FloorScore program.
    b. 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.
    c. California Collaborative for High Performance Schools (CA-CHPS) Criteria Interpretation for EQ 2.2 dated July 2012 and listed in the CHPS High performance Product Database.
    d. CDPH criteria as certified under the Greenguard Children's and Schools Program.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples for Verification: Full size tiles for each type of floor tile indicated.

D. Maintenance Data: For each type of floor tile to include in maintenance manuals.

E. Manufacturer's standard commercial warranty document.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile 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 or more than 90 deg F. Store floor tiles on flat surfaces.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.8 WARRANTY

A. Manufacturer's standard limited commercial warranty: 10 years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Sustainability Requirements: Resilient tile flooring shall comply with at least one of the following (Per 2019 California Green Building Standards Code, Section 5.504.4.6):

1. Certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.
2. 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.
3. Compliant with the California Collaborative for High Performance Schools (CA-CHPS) Criteria Interpretation for EQ 2.2 dated July 2012 and listed in the CHPS High performance Product Database.
4. Compliant with CDPH criteria as certified under the Greenguard Children's and Schools Program.

2.2 SOLID VINYL FLOOR TILE

A. Basis-of-Design Manufacturer: Provide products indicated as manufactured by the following:

1. Mohawk Group; Lineate.
    a. Subject to compliance with requirements, provide products indicated or equal products by one of the following:
        1) Armstrong Flooring Corp.
        2) Congoleum, Inc.
        3) Tandus Centiva, a Tarkett Company.

B. Tile Standard: ASTM F1700.

1. Class: Class III.
2. Type: A, Smooth Surface.

C. Thickness: 0.2 inch (5.0 mm).

D. Size: 9 by 59 inches (235 by 1505 mm).

E. Static Load: ASTM F970, passes, modified 1000 psi.

F. Critical Radiant Flux: Class 1, passes ASTM E648, not more than 0.45 watts/sq. cm.

G. Smoke Density: ASTM E662 Part A, less than 450.

H. Colors and Patterns: Marker 857 and Cord 957.

2.3 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.

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. 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 floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

a. 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.
b. Do not abrasively clean concrete substrates have been treated with a topical concrete vapor control barrier; comply with requirements of vapor control barrier manufacturer.

2. Testing Concrete Substrates: Owner will engage a testing agency to perform tests for moisture vapor emission, humidity, and pH per Division 09 Section “Flooring Moisture and pH Testing.” In the absence of Owner testing, perform the following tests:

a. Testing for pH: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate pH falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9.

b. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

1) Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
2) Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

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 floor tiles until they are same temperature as space where they are to be installed.

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.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated on Drawings.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, under accessible sink counters/cabinets, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other non-permanent, non-staining marking device.

G. Install per manufacturer’s written instructions using the *Floating ERT with Unipush Locking System* without adhesive.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION

SECTION 096810
CARPET TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes modular carpet tile.

B. Related Sections include the following:

1. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.
2. Division 09 Section “Flooring Moisture and pH Testing.”

1.3 SUBMITTALS

A. Product Data: For carpet tile, adhesives, and accessory materials.

1. Carpet Tile: For each type indicated, include manufacturer's written data on physical characteristics, durability, fade resistance, and installation recommendations for each type of substrate.
2. Documentation of VOC content for adhesives.
3. Documentation indicating carpet complies with at least one of the following:
    a. Testing and product requirements of CRI's "Green Label Plus" program.
    b. Carpet and installation adhesives products comply with the testing and product requirements of the California Department of Public Health’ "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
    c. NSF/ANSI 140 at the Gold level or higher.
    d. Scientific Certifications Systems Sustainable Choice.

B. 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.

C. Qualification Data: For Installer.

D. 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.

E. Warranty: Special warranty specified in this Section.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, 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 sq. yd.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by manufacturer for installation of manufacturer’s products.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.7 FEILD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.8 WARRANTY

A. Special Warranty for Carpet Tiles: 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, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranties and Warranty Periods:

a. Wear Warranty: Manufacturer's lifetime limited warranty including face wear, moisture barrier, delamination, tuft bind, unraveling, and static protection.
b. Bleach Resistant Warranty: ColorSafe with 15 year limited warranty against color loss from bleach spills.
c. Stain Resistance: XGUARD with 15 year limited warranty against staining.

PART 2 - PRODUCTS

2.1 CARPET TILE, GENERAL

A. Carpet tile shall meet product and testing requirements of at least one of the following:

1. Testing and product requirements of CRI's "Green Label Plus" program.
2. Carpet and installation adhesives products comply with the testing and product requirements of the California Department of Public Health' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
3. NSF/ANSI 140 at the Gold level or higher.
4. Scientific Certifications Systems Sustainable Choice.

2.2 CARPET TILE – DRAWING DESIGNATION CPT

A. Basis of Design: Drawings and Specifications are based on the following:

1. Mohawk Group; Diffuse Tile.

a. Subject to compliance with requirements, provide product indicated or a comparable product subject to Request for Substitution.

B. Physical Characteristics:

1. Color: Asphalt 999.
2. Size: 12 by 36 inches, modular tiles.
3. Construction: Textured Pattern Loop.
4. Face Fiber: Colorstrand® SD Nylon, with manufacturer's EcoSentry Plus Stain Protection and EcoSentry Soil Protection.
5. Dye Method: Solution Dyed.
6. Gauge: 1/12.
7. Stitches per Inch: 12.5.
8. Pile Thickness: 0.091 inches.
9. Tufted Yarn Weight: 16 ounces per square yard.
10. Average Density: 6,329.
11. Weight Density: 101,274.
12. Primary Backing: EcoFlex NXT.

C. Performance Characteristics:

1. Methenamine Pill Test (ASTM D 2859): Passes.
2. Radiant Panel Test (ASTM E 648): Class 1 (Direct Glue).
3. N.B.S. Smoke Chamber Test (ASTM E 662): Less than 450 (Flaming Mode).
4. Dimensional Stability AACHEN Test: Passes.
5. Electrostatic Propensity Test (AATCC 134): Less than 3.0 KV.
6. CRI Indoor Air Quality Control Green Label Plus ID: GLP1024.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended or provided by carpet tile manufacturer for releasable installation.

1. Releasable Adhesive:

a. CRI IAQ Testing Certification: PSA-970522.
b. Bond Warranty: 15-year Limited Warranty.

2. Adhesives shall have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, pH range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates to ensure adhesion of flooring products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

a. 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.
b. Do not abrasively clean concrete substrates have been treated with a topical concrete vapor control barrier; comply with requirements of vapor control barrier manufacturer.

2. Testing Concrete Substrates: Owner will engage a testing agency to perform tests for moisture vapor emission, humidity, and pH per Division 09 Section “Flooring Moisture and pH Testing.” In the absence of Owner testing, perform the following tests:

a. Testing for pH: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate pH falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9.
b. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

1) Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

2) Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

3. Adhesion Testing: Perform tests recommended by floor tile manufacturer.

C. 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.

D. 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 manufacturer.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

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, and thresholds,. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. 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.

F. Install pattern parallel to walls and borders.

3.4 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

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SECTION 099100
PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and field painting, staining or refinishing of the following:

1. Exposed exterior items and surfaces.
2. Exposed interior items and surfaces.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Related Sections include but are not limited to the following:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
3. Division 08 Sections for shop priming of metal doors and frames with primers specified in this Section.
4. Division 09 Section "Gypsum Board" for sealing gypsum board surfaces before application of surface textures with primers/sealers specified in this Section.
5. Division 21 through 23 Sections for additional requirements for painting of plumbing and mechanical items.
6. Division 26 through 28 Sections for additional requirements for painting of electrical items including intumescent coating on backboard panels.
7. Division 32 Section “Paving Specialties” for pavement markings.

1.3 SPECIAL REQUIREMENTS

A. Unauthorized removal or disconnecting of electrical fixtures, switches, or control devices may result in additional electrical work to comply with energy regulations of governing agencies. Contractor shall be financially responsible with no additional cost to the Owner for additional electrical work due to unauthorized removal or disconnecting of electrical fixtures, swithes, or control devices.

1.4 DEFINITIONS

A. Definitions of gloss levels below are from "MPI Architectural Painting Specification Manual" (hereafter, "MPI Manual").

1. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
2. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
3. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
4. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
5. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
6. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.5 SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on 8 inch square samples of actual material to be painted or stained. For masonry surfaces, include a mortar joint.
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.

D. 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.
2. VOC content.

E. Coating Maintenance Manual: Submit with Closeout/Maintenance Submittals a Coating Maintenance manual; manual shall include a floor plan with rooms identified by name and number, a finish schedule coordinated with the floor plan, designations of where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F.

1. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
2. Keep storage area neat and orderly. Remove oily rags and waste daily.
3. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.8 PROJECT CONDITIONS

A. Apply paints only when the temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Protection:

1. Cover or otherwise protect finished work of other trades, work not to be painted concurrently, landscaping, and adjacent property from damage.
2. When not in use, store paints in designated areas. Keep containers closed. At end of day's work, remove empty containers, paint soaked rags, and debris. Vent fumes. Take precautions to prevent fire.

D. Sequencing, Scheduling:

1. Coordinate removal and replacement of hardware, electrical fixtures and trim, and related work of other Sections.
2. Stain, prime, back paint, and pre-finish items before installation as required.

E. Cleaning and Disposal:

1. Do not use Project plumbing fixtures or piping systems for:

a. Cleaning painting equipment and utensils.
b. Disposal of waste from cleaning or disposal of paints.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Scheduled Paint Systems: Provide paint systems as scheduled on the Drawings and listed in Part 3 Article “Paint Systems” to comply with requirements in this Section.

1. Named Manufacturers' Products: Manufacturer and product designations indicated in the scheduled paint systems are for the purpose of establishing minimum requirements; unless otherwise indicated, paint products are based on products manufactured by the following:

a. Sherwin Williams Paints.

1) Subject to compliance with requirements, provide the named products or comparable products by one of the following:

a) Dunn-Edwards Paints.
b) Glidden Professional.
c) PPG Paints.
d) Tnemec.
e) Kynar

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: 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.

1. 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. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

C. VOC Content: Paints and coatings applied at the Project site shall comply with VOC limits of authorities having jurisdiction; VOC limits, exclusive of colorants added to a tint

base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); and VOC limits of the California Green Building Standards Code (CGBSC), Section 5.504.4.3 and Table 504.4.3 as follows:

1. Flat Paints and Coatings: VOC not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC not more than 100 g/L.
3. Nonflat High-Gloss Paints and Coatings: VOC not more than 150 g/L.
4. Dry-Fog Coatings: VOC not more than 150 g/L.
5. Floor Coatings: VOC not more than 100 g/L.
6. Pretreatment Wash Primers: VOC not more than 420 g/L.
7. Primers, Sealers, and Undercoaters: VOC not more than 100 g/L.
8. Rust Preventative Coatings Applied to Ferrous Metals: VOC not more than 250 g/L.
9. Shellacs, Clear: VOC not more than 730 g/L.
10. Shellacs, Pigmented: VOC not more than 550 g/L.
11. Stains: VOC not more than 250 g/L.
12. Clear Wood Finishes, Varnishes: VOC not more than 275 g/L.
13. Clear Wood Finishes, Lacquers: VOC not more than 275 g/L.
14. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.

D. Colors: Provide color selections made by the Architect. Colors shall be factory mixed and match approved samples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Portland Cement Plaster: 12 percent.
5. Gypsum Board: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

D. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

G. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and 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. Electrical Items: Remove only switch and outlet cover plates and similar items that do not require disconnecting wiring. Do not disconnect wiring or remove electrical fixtures, swithes, or control devices unless otherwise indicated on Electrical Drawings.

a. Contractor may be subject to additional costs due to unautorized removal of items, refer to Part 1 Article “Special Requierments.”

2. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

D. Concrete and Masonry Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Perform appropriate tests to determine alkalinity and moisture content of surfaces; testing shall be performed or witnessed by a certified representative of the paint manufacturer. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

1. Cracks and defects at concrete and masonry surfaces shall be filled with cement grout; match surface texture.
2. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. Steel Structures Painting Council's (SSPC), SSPC-SP 3, "Power Tool Cleaning."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required.

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood.
    a. When transparent finish is required, backprime with spar varnish.
    b. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
    c. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

J. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

K. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

L. Drywall: Fill any cracks or defects with drywall joint compound. Sand any rough spots smooth. Do not raise nap on paper covering.

3.3 APPLICATION

A. General: Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual." Paint/stain exposed surfaces, except where schedules indicate that a surface or material is not to be painted/stained or is to remain natural. If schedules do not specifically mention an item or surface to be painted, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

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.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
7. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
8. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
9. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

    a. Prefinished items include the following factory-finished components:

        1) Aluminum storefronts and entrances.
        2) Anodized aluminum trim for wood wall panels, gypsum board and plaster.
        3) Acoustical wall or ceiling panels.
        4) Vinyl covered tack board
        5) Toilet and urinal partitions.
        6) Stainless steel or chrome plated items.
        7) Finished mechanical and electrical equipment.
        8) Light fixtures.
        9) Distribution cabinets.
        10) Any prefinished/factory finished item.

    b. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

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.

D. Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

E. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

F. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even satin luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

K. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

M. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work: Paint the following work where exposed to view at applications indicated:

1. Equipment rooms:

a. Telecommunications backboards; paint with intumescent paint.
b. Equipment, including panelboards.
c. Uninsulated metal piping.
d. Uninsulated plastic piping.
e. Pipe hangers and supports.
f. Metal conduit.
g. Plastic conduit.
h. Tanks that do not have factory-applied final finishes.
i. Ducts, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
j. Other items as directed by Architect.

2. Occupied areas:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Ducts, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
i. Other items as directed by Architect.

3. Exterior locations:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.

d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.

3.4 CLEANING AND PROTECTION

A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the 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 Architect, and leave in an undamaged condition.

D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

E. Correction of Defective Work:

1. Repair abraded, damaged or incomplete paint surfaces by methods acceptable to Architect. Spot repairs to be well-blended into adjacent work. For large repairs, re-coat entire plane or building element in which damaged area occurs.
2. Defaced surfaces of work not to be painted shall be cleaned and their original finish restored.

F. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 PAINT SYSTEMS

(Interior and exterior paint systems are on the following pages)

A. Interior Paint Systems **(Bold Represents Basis of Design):**

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
(I-1)	Gypsum Drywall	PI-10	Flat, Latex	First Coat Second Coat Third Coat	B28 B30 B30	ProMar 200 Zero Primer ProMar 200 Zero Flat ProMar 200 Zero Flat
		PI-11	Semi-Gloss Latex	First Coat Second Coat Third Coat	B28 B31 B31	ProMar 200 Zero Primer ProMar 200 Zero SG ProMar 200 Zero SG
		PI-12	**Eggshell Enamel Latex**	**First Coat Second Coat Third Coat**	**061 B20 B20**	**ProMar 200 Zero Primer ProMar 200 Zero EG ProMar 200 Zero EG**
	(Textured)	PI-13	Flat	One Coat	A44	Tuff Surface
(I-2)	Wood	PI-20	Semi-Gloss Latex	First Coat Second Coat Third Coat	B28 B31 B31	Premium Wall & Wood ProMar 200 Zero SG ProMar 200 Zero SG
		PI-21	Eggshell Enamel, Latex	First Coat Second Coat Third Coat	168 A75 A75	Premium Wall & Wood Solo EG Solo EG
		PI-22	Lacquer Velvet	Stain First Coat Second Coat Third Coat	 15700 27520 27520	Minwax 250 Sanding Sealer High Solids Velvet Lacquer High Solids Velvet Lacquer
		PI-23	Lacquer Semi-Gloss	Stain First Coat Second Coat Third Coat	 15700 27540 27590	Minwax 250 Sanding sealer High Solids S.G. Lacquer High Solids S.G. Lacquer
		PI-24	Lacquer Gloss	Stain First Coat Second Coat Third Coat	 15700 27590 27590	Minwax 250 Sanding Sealer High Solids Gloss Lacquer High Solids Gloss Lacquer
		PI-25	Varnish Velvet	Stain First Coat Second Coat Third Coat	 A68 A68 A68	Minwax 250 Wood Classics Wood Classics Wood Classics
		PI-26	Varnish Semi-Gloss	Stain First Coat Second Coat Third Coat	 A68 A68 A68	Minwax 250 Wood Classics Wood Classics Wood Classics
(I-3)	Telecom Plywood Backboard	**PI-30**	**Intumescent Paint**	**Primer** **First Coat Second Coat**		**(Primer if req. by intumescent paint mfr) Flame Stop IM Flame Stop IM**

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
(I-4)	Ferrous Metal	PI-40	Flat Latex	First Coat Second Coat Third Coat	B66310 A74 A74	ProCryl Metal Primer Solo Flat SoloFlat
		PI-41	**Semi-Gloss Latex**	**First Coat Second Coat Third Coat**	**B66310 A76 A76**	**ProCryl Metal Primer Solo SG Solo SG**
	Ferrous Metal (Cont.)	PI-42	Eggshell Latex	First Coat Second Coat Third Coat	B66310 A75 A75	ProCryl Metal Primer Solo EG Solo EG
(I-5)	Galv. Metal/	PI-50	Flat Latex	First Coat Second Coat Third Coat	B66310 A74 A74	ProCryl Metal Primer Solo Flat Solo Flat
		PI-51	**Semi-Gloss Latex**	**First Coat Second Coat Third Coat**	**B66310 A76 A76**	**ProCryl Metal Primer Solo SG Solo SG**
		PI-52	Eggshell Latex	First Coat Second Coat Third Coat	B66310 A75 A75	ProCryl Metal Primer Solo EG Solo EG
(I-6)	**Aluminum**	**PI-60**	**Semi-gloss**	**70% PVDF FPF**		
		PI-61	**Semi-Gloss Latex**	**First Coat Second Coat Third Coat**	**B66310 A76 A76**	**ProCryl Metal Primer Solo SG Solo SG**
(I-7)	Plaster, Concrete, Brick	PI-70	Flat Latex	First Coat Second Coat Third Coat	LX02 B30 B30	Loxon ProMar 200 Zero Flat ProMar 200 ZeroFlat
		PI-71	Semi-Gloss Latex	First Coat Second Coat Third Coat	LX02 B31 B31	Loxon ProMar 200 Zero SG ProMar 200 Zero SG
		PI-72	Eggshell Latex	First Coat Second Coat Third Coat	LX02 B20 B20	Loxon ProMar 200 Zero EG ProMar 200 Zero EG
(I-8)	Concrete Block	PI-80	Flat latex	First Coat Second Coat Third Coat	B25 B30 B30	PrepRite Block Filler ProMar 200 Zero Flat ProMar 200 Zero Flat
		PI-81	Semi-Gloss Latex	First Coat Second Coat Third Coat	B25 B31 B31	PrepRite Block Filler ProMar 200 Zero SG ProMar 200 Zero SG
		PI-82	Eggshell Latex	First Coat Second Coat Third Coat	B25 B20 B20	PrepRite Block Filler ProMar 200 Zero ProMar 200 Zero
(I-9)	Acoustical Ceiling Tile/ Plaster	PI-90	Latex	One Coat to Cover	A21	EcoSelect

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
	Ceramic Tile like Finishes	PI-91	Epoxy	First Coat Second Coat Third Coat	B51 B73 B73	Multi Purpose Primer PI Waterbased Epoxy PI Waterbased Epoxy
	Ceiling and Wall w/ misc. Pipes & Conduit Exposed, Trusses & Beams w/Spray-on Fire Insulation and Trim	**PI-92**	**Eggshell Latex**	**First Coat Second Coat Third Coat**	**B66310 A75 A75**	**ProCryl Metal Primer Solo EG Solo EG**

B. Exterior Paint Systems (Bold Represents Basis of Design)

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
(E-1)	Plaster, Concrete	PE-10	Flat, Acrylic	First Coat Second Coat Third Coat	LX02 A6 A6	Loxon A-100 A-100
		PE-11	Low Sheen Enamel Acrylic	First Coat Second Coat Third Coat	LX02 126 126	Loxon A-100 A-100
		PE-12	**Elastomeric (Smooth) 5 year labor warranty**	**First Coat Second Coat Third Coat (Spray App.)**	**LX02 CF12C F12**	**Loxon Masonry Primer Conflex XL Conflex XL**
		PE-13	Elastomeric (Medium Aggregate) 5 year labor warranty	First Coat Second Coat Third Coat	LX02 CF12 CF12	Loxon Masonry Primer Conflex XL Conflex XL
(E-2)	Concrete Block Masonry	PE-20	Flat, acrylic emulsion	First Coat Second Coat Third Coat	B25 A6 A6	PrepRite Block Filler A-100 A-100
		PE-21	Elastomeric Smooth 5 year labor warranty	First Coat Second Coat Third Coat	LX02 CF12 CF12	Loxon Masonry Primer Conflex XL Conflex XL
		PE-22	Elastomeric (Medium Aggregate) 5 year labor warranty	First Coat Second Coat Third Coat	LX02 CF12 CF12	Loxon Masonry Primer Conflex XL Conflex XL

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
		PE-23	Elastomeric (Coarse Aggregate)	First Coat Second Coat Third Coat	LX02 CF12 CF12	Loxon Masonry Primer Conflex XL Conflex XL
		PE-24	Clear Water Repellent 10 year Warranty	1 Coat	LX31	Loxon 40% Water Repellant (A31T40)
(E-3)	Wood	PE-30	Flat Acrylic Emulsion	First Coat Second Coat Third Coat	B42 A6 A6	Exterior Wood Primer A-100 A-100
		PE-31	Semi-Gloss Acrylic	First Coat Second Coat Third Coat	B42 A76 A76	Exterior Wood Primer Solo SG Solo SG
		PE-32	Low Sheen Enamel Acrylic	First Coat Second Coat Third Coat	B42 A75 A75	Exterior Wood Primer Solo LS Solo LS
		PE-33	Flat, Stain, Water Base, Semi-Transp.	First Coat Second Coat	A15T A15T	Deckscapes ST Stain Deckscapes ST Stain (A15T00215)
		PE-34	Flat, Stain Opaque	First Coat Second Coat	A6 A6	A100 A100
		PE-35	Varnish Clear Gloss	First Coat Second Coat Third Coat	6509 6509 6509	McCloskey's Spar McCloskey's Spar McCloskey`s Spar
		PE-36	Stain and Varnish	First Coat Second Coat Third Coat	 6509 6509	Aqua Seal McCloskey's McCloskey's
(E-4)	Ferrous Metal-	PE-40	Gloss, High Perform.	First Coat Second Coat Third Coat	646 B65 B65	Macropoxy Epoxy Acrolon 100 Acrolon 100
		PE-41	**Semi-Gloss High Perform.**	**First Coat** **Second Coat** **Third Coat**	**B66-310** **B66** **B66**	**ProCryl Primer** **Pro Ind DTM Acrylic** **Pro Ind DTM Acrylic**
	Struct. Steel- AESS	**PE-42**	**Semi-Gloss High Perform.**	**First Coat** **Second Coat** **Third Coat**	**646** **B65** **B65**	**Marcopoxy Epoxy** **Acrolon 100 Semi Gloss** **Acrolon 100 Semi Gloss**
(E-5)	Galv. Metal & Aluminum	PE-50	Gloss	First Coat Second Coat Third Coat	B66-310 A77 A77	ProCryl Primer Solo GL Solo GL
		PE-51	Flat, Acrylic	First Coat	B66-310	ProCryl Primer

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
				Second Coat Third Coat	A74 A74	Solo Flat Solo Flat
	Clips and non exposed surfaces	**PE-52**	**Semi-Gloss Enamel Acrylic**	**First Coat** **Second Coat** **Third Coat**	**B66-310** **B53** **B53**	**ProCryl Primer** **PI WB Urethan Enamel** **PI WB Urethan Enamel**
		PE-53	Gloss	First Coat Second Coat Third Coat	B66-310 A77 A77	ProCryl Primer Solo GL Solo GL
		PE-54	Semi Gloss	First Coat Second Coat Third Coat	B66-310 A76 A76	ProCryl Primer Solo S/G SoloS/G
	Visible Surfaces	**PE-55**	**Semi-gloss**	**70% PVDF FPF**		**Kynar 500**
(E-6)	**Alum. Flashing**	**PE-60**	**Semi-gloss**	**70% PVDF FPF**		**Kynar 500**
	Alum. Openings	**PE-62**	**Semi-gloss**	**70% PVDF FPF**		**Permaflour**

END OF SECTION

SECTION 101400
SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior and exterior panel signs for room or space identification and way-finding.

B. Related Sections:

1. Division 01 Section “Temporary Facilities and Controls” for Project identification signage.
2. Division 10 Section “Dimensional Sign Characters” for individual character signs.
3. Division 22, 23, and 26 Sections as applicable to Plumbing, Mechanical, and Electrical Work for tags and nameplates for equipment.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and full-scale template layout of characters and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.

1. Provide message list for each sign, including large-scale details of wording, lettering, and Braille layout.

C. Schedule: Schedule indicating sign locations, type, other pertinent data, and referenced to rooms or doors with the same referencing as used on the Drawings.

D. Braille Text Certification: Provide certification from the sign manufacturer that Braille text complies with regulatory requirements indicated (Contracted (Grade 2) per 2022 CBC Section 11B-703.3).

E. Braille Text Translation Confirmation: Provide confirmation of Braille text translations.

F. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for each type of sign and material indicated.

G. Samples for Verification: Provide 2 full size sample signs showing edge and corner condition, border, text characters of height specified, Braille text, and selected colors, of each type of sign indicated. Sample will be retained by Architect.

H. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each sign type through one source from a single manufacturer.

1.5 FIELD 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.

1.6 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to replace signs that fail in materials or workmanship within specified warranty period.

1. Damage from deliberate destruction and vandalism is excluded.
2. Warranty Period for Interior Signs: Building lifetime.
3. Warranty Period for Exterior Signs: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS FOR SIGNS

A. Regulatory Requirements: Comply with requirements of the following:

1. 2010 ADA Standards for Accessible Design.
2. ANSI A117.1.
3. 2022 California Building Code, Sections 11B-216 and 11B-703.

B. Room or Space Identification Signs, CBC 11B-216.2: Where provided, signs identifying permanent rooms and spaces shall comply with CBC Sections 11B-703.1, 11B-703.2, 11B-703.3, and 11B-703.5. Where pictograms are provided as designations of permanent rooms and spaces, the pictograms shall comply with CBC Section 11B-703.6 and shall have text descriptors complying with CBC Sections 11B-703.2 and

11B-703.5. Exterior signs that are not located at the door to the space they serve shall not be required to comply with CBC Section 11B-703.2.

C. Directional and Informational Signs, CBC 11B-216.3: Signs that provide direction to or information about spaces and facilities shall comply with CBC Section 11B-703.5.

D. Means of Egress Signs, CBC 11B-216.4: Tactile exit signs required by CBC Section 1013.4 at doors to exit passageways, exit discharge, and exit stairways shall comply with CBC Sections 11B-703.1, 11B-703.2, 11B-703.3, and 11B-703.5.

E. Inspection, CBC 11B-703.1.1.2: Signs and identification devices shall be field inspected after installation and approved by the enforcing agency prior to the issuance of a final certificate of occupancy per Chapter 1, Division II, Section 111, or final approval where no certificate of occupancy is issued. The inspection shall include, but not be limited to, verification that Braille dots and cells are properly spaced and the size, proportion and type of raised characters are in compliance with the regulations of CBC Section 11B-703.

F. Raised Characters, CBC 11B-703.2: Raised characters shall comply with CBC Section 11B-703.2 and shall be duplicated in Braille complying with CBC Section 11B-703.3. Raised characters shall be installed in accordance with CBC 11B-703.4.

1. Depth: Raised characters shall be raised 1/32-inch minimum above their background.
2. Case: Raised characters shall be upper case.
3. Style: Raised characters shall be sans serif. Characters shall not be italic, oblique, script, highly decorative, or other unusual forms.
4. Character Proportions: Raised characters (Text) on signs shall be selected from fonts where the width of the uppercase letter “O” is 60 percent minimum and 110 percent maximum of the height of the uppercase letter “I”.
5. Character Height: Character height measured vertically from the baseline of the character shall be of 5/8-inch minimum and 2-inches maximum based on the height of the uppercase letter “I”.
6. Stroke Thickness: Stroke thickness of the uppercase letter “I” shall be 15 percent maximum of the height of the character.
7. Character Spacing: Character spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8 inch minimum and 4 times the raised character stroke width maximum. Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch minimum and 4 times the raised character stroke width maximum at the base of the cross sections, and 1/8 inch minimum and 4 times the raised character ma stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch minimum.
8. Line Spacing: Spacing between the baselines of separate lines of raised characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.
9. Format: Text shall be in a horizontal format.
10. Finish and Contrast: Characters and their background shall have a non-glare finish. Characters shall contrast with their background with either light characters

on a dark background or dark characters on a light background. Requirement applies to all signs.

G. Braille, CBC 11B-703.3: Braille shall be contracted (Grade 2) and shall comply with CBC Sections 11B-703.3 and 11B-703.4.

1. Dimensions and Capitalization (CBC 11B-703.3.1): Braille dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1. The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms. Braille dot physical requirements shall be per CBC Table 11B-703.3.1 as indicated below; dimensions for distances are measured from center to center of Braille dots:

    a. Dot Base Diameter: 0.059 inch minimum, 0.063 inch maximum.
    b. Distance between Two Dots in the same Cell: 0.100 inches.
    c. Distance between corresponding Dots in adjacent Cells: 0.300 inches.
    d. Dot Height: 0.025 inch minimum, 0.037 inch maximum.
    e. Distance between corresponding Dots from one cell directly below: 0.395 inch minimum, 0.400 inch maximum.

2. Position (CBC 11B-703.3.2): Braille shall be positioned below the corresponding text in a horizontal format, flush left, or centered. If text is multi-lined, Braille shall be placed below the entire text. Braille shall be separated 3/8 inch minimum and 1/2 inch maximum from any other tactile characters and 3/8 inch minimum and from raised borders and decorative elements.

H. Sign Installation Height and Location, CBC 11B-703.4:

1. Height Above Ground or Floor: Tactile characters on signs shall be located 48 inches minimum above the finish floor or ground surface, measured from the baseline of the lowest Braille cells and 60 inches maximum above the finish floor or ground surface, measured form the baseline of the highest line of raised characters.
2. Location: Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side. Where a tactile sign is provided at double doors with one active leaf, the sign shall be located on the inactive leaf. Where a tactile sign is provided at double doors with two active leafs, the sign shall be located to the right of the right-hand door. Where there is no wall space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall. Signs containing tactile characters shall be located so that a clear floor space of 18 inches minimum by 18 inches minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45-degree open position. Where provided, signs identifying permanent rooms and spaces shall be located at the entrance to, and outside of the room or space. Where provided, signs identifying exits shall be located at the exit door when approached in the direction of egress travel.

I. Visual Characters, CBC 11B-703.5: Visual characters are considered to be intended for signage that is not accompanied by Braille. (The requirements of this Section do not apply to room identification signage).

1. Finish and Contrast: Characters and their background shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background. Requirement applies to all signs.
2. Case: Characters shall be upper case or lower case or a combination of both.
3. Style: Characters shall be conventional in style. Characters shall not be italic, oblique, script, highly decorative, or other unusual forms.
4. Character Proportions: Characters shall be selected from fonts where the width of the uppercase letter “O” is 60 percent minimum and 110 percent maximum of the height of the uppercase letter “I”.
5. Character Height: Minimum character height shall be based on the uppercase letter “I” and shall comply with CBC Table 11B-703.5.5 as follows:

    a. Height of baseline of character from finish floor:

        1) 40 inches minimum to less than or equal to 70 inches with a horizontal viewing distance of:

            a) Less than 72 inches: Minimum character height to be 5/8 inch.
            b) 72 inches and Greater: Minimum character height to be 5/8 inch plus 1/8 inch for each foot of viewing distance beyond 72 inches.

        2) Greater than 70 inches to less than or equal to 120 inches with a horizontal viewing distance of:

            a) Less than 180 inches: Minimum character height to be 2 inches.
            b) 180 inches and Greater: Minimum character height to be 2 inches plus 1/8 inch for each foot of viewing distance beyond 180 inches.

        3) Greater than 120 inches, with a horizontal viewing distance of:

            a) Less than 21 feet: Minimum character height to be 3 inches.
            b) 21 feet and Greater: Minimum character height to be 3 inches plus 1/8 inch for each foot of viewing distance beyond 21 feet.

6. Height from Finish Floor or Ground: Visual characters shall be 40 inches minimum above the finish floor or ground measured to the baseline of the character.
7. Stroke Thickness: Stroke thickness of the uppercase letter “I” shall be 10 percent minimum and 20 percent maximum of the height of the character.
8. Character Spacing: Character spacing shall be measured between the two closest points of adjacent raised characters, excluding word spaces. Spaces between individual characters shall be 10 percent minimum and 35 percent maximum of character height.
9. Line Spacing: Spacing between the baselines of separate lines of characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.
10. Format: Text shall be in a horizontal format.

J. Pictograms, CBC 11B-703.6:

1. Pictogram Field: Pictograms shall have a field height of 6 inches minimum. Characters and Braille shall not be located in the pictogram field.
2. Finish and Contrast: Pictograms and their field shall have a non-glare finish. Pictograms shall contrast with their field with either a light pictogram on a dark field or a dark pictogram on a light field.
3. Text Descriptors: Pictograms shall have text descriptors located directly below the pictogram field. Text descriptors shall comply with CBC Sections 11B-703.2, 11B-703.3, and 11B-703.4.

K. Symbols of Accessibility, CBC 11B-703.7:

1. Finish and Contrast: Symbols of accessibility and their background shall have a non-glare finish. Symbols of accessibility shall contrast with their background with either a light symbol on a dark background or a dark symbol on a light background.
2. Symbols:
    a. International Symbol of Accessibility (ISA): ISA symbols shall comply with CBC Figure 11B-703.7.2.1. The symbol shall consist of a white figure on a blue background. The blue shall be Color No. 15090 in Federal Standard 595B.
    b. International Symbol of Teletypewriter (TTY): The International Symbol of Teletypewriter (TTY) shall comply with CBC Figure 11B-703.7.2.2.
    c. Volume Control Telephones: Telephones with a volume control shall be identified with a pictogram complying with CBC Figure 11B-703.7.2.3.
    d. Assistive Listening Systems: Assistive listening systems shall be identified by the International Symbol of Access for Hearing loss complying with CBC Figure 11B-703.7.2.4.
    e. Toilet and Bathing Facilities, Geometric Symbols: Doorways leading to toilet and bathing rooms shall be identified by a geometric symbol complying with CBC Section 11B-703.7.2.6. The symbol shall be mounted at 58 inches minimum and 60 inches maximum above the finish floor measured from the centerline of the symbol. Where a door is provided, the symbol shall be mounted within 1 inch of the vertical centerline of the door.
        1) Men’s Toilet and Bathing Facilities: Men’s toilet and bathing facilities shall be identified by an equilateral triangle, 1/4 inch thick, with edges 12 inches long and a vertex pointing upward. The triangle symbol shall contrast with the door, either light on dark background or dark on a light background.
        2) Women’s Toilet and Bathing Facilities: Women’s toilet and bathing facilities shall be identified by a circle, 1/4 inch thick and 12 inches in diameter. The circle symbol shall contrast with the door, either light on dark background or dark on a light background.
        3) Unisex Toilet and Bathing Facilities: Unisex toilet and bathing facilities shall be identified by a circle, 1/4 inch thick and 12 inches in diameter with a 1/4 inch thick triangle with a vertex pointing upward superimposed on the circle and within the 12 inch diameter. The triangle symbol shall contrast with the circle symbol, either light on dark background or dark on a light background, the circle symbol

shall contrast with the door, either light on dark background or dark on a light background.

4) Edges and Corners: Edges of geometric symbols shall be rounded, chamfered, or eased. Corners of geometric symbols shall have a minimum radius of 1/8 inch.

2.2 MANUFACTURERS

A. Manufacturers, Basis-of-Design Products: In other Articles where named manufacturer's products are indicated, Drawings and Specifications are based on products manufactured by:

1. Mohawk Sign Systems.

a. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:

1) ASI-Modulex, Inc.
2) Best Sign Systems Inc.
3) Gemini Incorporated.

2.3 PANEL SIGNS

A. General: Provide smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally from corner to corner complying with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

B. Design Requirements: Panel signs shall comply with Part 2 Article "Regulatory Requirements for Signs."

C. Scheduled Signs: Provide signs as indicated on Drawings and as scheduled in Part 3 Article "Sign Schedule."

D. Interior Wall Panel Signs:

1. Basis of Design: Mohawk Sign Systems Inc.; Model 200A, Format D, sand-carved process,
2. Material: MP plastic, phenolic-backed melamine plastic laminate faced sheet, 0.125-inch thick.
3. Edge Condition: Flat.
4. Corner Condition: Eased to radius of 1/2 inch.
5. Border: 3/8-inch wide.
6. Text Font: Helvetica medium.
7. Text Height: 1 inch unless indicated otherwise on Drawings.
8. Pictogram: None
9. Mounting: Unframed, wall mounted with adhesive.
10. Colors:

a. Background: Grey, Pantone 445C.
b. Text: Bright White.

E. Interior Door Geometric Symbol Signs:

1. Basis of Design: Mohawk Sign Systems Inc.; Model 200A, Format D, sand-carved process,
2. Material: MP plastic, phenolic-backed melamine plastic laminate faced sheet, 0.25-inch thick.
3. Edge Condition: Flat.
4. Corner Condition: Eased to radius of 1/2 inch.
5. Border: None.
6. Text Font: Helvetica medium. Text is not required for this class of sign and is preferred without any, nor pictograms.
7. Text Height: 1 inch unless indicated otherwise on Drawings.
8. Pictogram: Optional.
9. Mounting: Unframed, door mounted with adhesive.
10. Colors:

    a. Background: Blue, Pantone 301C.
    b. Text: Bright White.

F. Sign Backs/Blanks: Provide matching sign blanks for signs mounted to transparent and/or semi-transparent glazed surfaces to conceal exposed sign backs.

1. Where sign backs/blanks are located within the interior of the building, signs shall be of the same material as other interior signs.
2. Where sign backs/blanks are located on the exterior of the building, signs shall be of the same material as other exterior signs.
3. Profile and size of sign backs/blanks shall match that of the sign backs that are to be concealed.

2.4 ACCESSORIES

A. Mechanical Fasteners: Use tamper resistant fasteners fabricated from materials that are not corrosive to sign material and mounting surface.

B. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and with sign surfaces free from distortion and other defects in appearance.
2. Install signs at locations required by regulatory requirements, as indicated on the Drawings, and per this Specification section.

B. Height: Install signs at heights indicated on Drawings and to comply with regulatory requirements indicated in Part 2 Article “Regulatory Requirements for Signs” of this specification Section.

1. Sign mounting height shall be consistent for the Project.

C. Location Relative to Door Openings: Install signs relative to door openings as indicated on Drawings and to comply with regulatory requirements indicated in Part 2 Article “Regulatory Requirements for Signs” of this specification Section.

1. Sign location relative to door openings shall be consistent for the Project.

D. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:

1. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
2. Where panel signs are mounted on glass, provide matching blank plate on opposite side of glass to conceal mounting materials.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

B. Clean per manufacturer’s recommendation prior to final inspection.

3.4 SIGN SCHEDULE

A. Interior Room Identification Signs: Provide interior room identification signage adjacent to doors as indicated and scheduled on the Drawings.

1. Text Content: Identify rooms by number and name unless otherwise indicated. Room names and numbering shall comply with Owner’s instructions (not Architect’s referencing or numbering as indicated on the Drawings).

2. Text Height: As indicated on Drawings and in compliance with referenced CBC and ADA requirements.
3. Sign Size: As indicated on drawings.

B. Tactile Exit Signs: Provide tactile exit signs at locations indicated on Drawings, as required to comply with regulatory requirements, and as follows:

1. Exterior Doors: Each grade level exterior exit door from a room or space having an illuminated exit sign shall be identified by a tactile exit sign with the word “EXIT”.
2. Interior Rooms to Exits: Each exit door to a corridor, exit enclosure, or exit passageway, from a room having an illuminated exit sign shall be identified by a tactile exit sign with the words “EXIT ROUTE”.
3. Doors to Stairs and Ramps: Each exit door that leads directly to a grade-level exterior exit by means of a stairway or ramp shall be identified by a tactile exit sign with the following words:

    a. EXIT STAIR DOWN.

C. Toilet Room Identification Signs: Signage shall consist of door mounted geometric symbols and wall mounted identification signs to comply with regulatory requirements and as indicated on the Drawings.

END OF SECTION

SECTION 101405
DIMENSIONAL SIGN CHARACTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Cast aluminum dimensional sign characters.
2. Molded-plastic dimensional characters.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale layout of characters and other components. Show mounting methods, layout, spacing, reinforcement, accessories, and installation details.

C. Samples for Verification: Dimensional characters, full-size sample of each type of dimensional character for material, finish, color, size, and mounting indicated.

D. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain dimensional characters through one source from a single manufacturer.

1.5 FIELD 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.

1.6 COORDINATION

A. Coordinate location of backing for dimensional character anchorage with wall framing.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Cast Channel Characters: 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. Manufacturer: Subject to compliance with requirements, provide products manufactured by one of the following:

   a. ASI-Modulex, Inc.
   b. Gemini Incorporated.
   c. Metal Arts; Div. of L&H Mfg. Co.

2. Character Material: Aluminum.
3. Finish: Baked-enamel or powder-coat. Manufacturer's standard satin polyester coating.

   a. Color: Aluminum Silver

4. Character Height: As indicated on Drawings.
5. Thickness: As indicated on Drawings.
6. Typeface: As indicated on Drawings.
7. Text Copy: As indicated on Drawings.
8. Mounting: Concealed studs, non-corroding for substrates encountered.

B. Molded-Plastic Characters Injection molded or thermoformed characters having uniform faces and profiles, and as follows:

1. Manufacturer: Subject to compliance with requirements, provide products manufactured by one of the following:

   a. ASI-Modulex, Inc.
   b. Gemini Incorporated.
   c. Mohawk Sign Systems.

2. Character Material: Polymer-based plastic.
3. Finish: As-cast
4. Character Height: As indicated on Drawings.
5. Thickness: As indicated on Drawings.
6. Typeface: As indicated on Drawings.
7. Text Copy: As indicated on Drawings.
8. Mounting: Concealed studs, non-corroding for substrates encountered.

2.2 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.

B. Molded Plastic: Polymer-based plastic.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish nonferrous-metal or stainless-steel devices unless otherwise indicated.
3. Sign Mounting Fasteners, Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
4. Sign Mounting Fasteners, Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
5. Sign Mounting Fasteners, Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.5 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. 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.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate characters where indicated on Drawings, install characters using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Provide paper template showing proper character layout spacing and connection points for installation.

C. Mounting Method:

1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    a. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.

3.3 CLEANING AND PROTECTION

A. Remove and replace damaged or deformed characters that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 101410
CAST METAL PLAQUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. (1) Cast metal plaque shall be provided adjacent to door “101A” in the exterior wall with the Horizontal Composite Wood Cladding Finish. Coordinate backing and mount plaque with stand off rods to allow for the plaque to flush out with the wall finish.

1.2 SUMMARY

A. This Section includes the following:

1. Cast metal plaques.

1.3 SUBMITTALS

A. Data for Initial Selection: Manufacturer's product data for selection of color, text height and style, background texture, border, edge details, mounting, and other pertinent data.

B. Shop Drawings: Include plans, elevations, and full-scale template layout of characters and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.

C. Samples for Verification: Plaque casting, 6 inches square, demonstrating actual border, text height and style, background texture, and finish.

D. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 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.

1.5 COORDINATION

A. Coordinate placement of backing for sign anchorage with wall framing.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bronze Castings: ASTM B 584, Alloy UNS No. C86500 (No. 1 manganese bronze).

2.2 CAST METAL PLAQUES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASI – Modulex.
2. Best Sign Systems Inc.
3. Gemini Incorporated.

B. Cast Plaques: Provide castings free of pits, scale, sand holes, and other defects, as follows:

1. Plaque Material: Bronze.
2. Size: 24 inches wide by 18 inches high.
3. Background Texture: Manufacturer's standard stipple texture.
4. Borders and Text Finish: Satin.
5. Border Style: Raised, single line.
6. Mounting: Concealed studs, noncorroding for substrates encountered.
7. Character Size and Style: To be selected by Architect from manufacturer’s standard styles and sizes.
8. Copy: Allow one letter per each square inch of plaque.
9. Graphics: None.

2.3 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.

2.4 COPPER-ALLOY FINISHES

A. 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 polished finish.
2. Background Finish: Dark oxidized.

B. Clear Protective Coating: Coat exposed surfaces of copper alloys with manufacturer's standard, clear organic coating specially designed for coating copper-alloy products.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

B. Cast-Metal Plaques: Mount plaques using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.

1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting adhesive.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

B. Protect wall plaque with heavy kraft paper to protect drips and other material during other finishing work surrounding installation.

C. Clean per manufacturer’s recommendation prior to final inspection.

END OF SECTION

SECTION 102113
TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes solid-polymer plastic toilet compartments configured as toilet enclosures and urinal screens; floor anchored and overhead braced.

B. Related Sections:

1. Division 09 Section “Non-Structural Metal Framing” for backing and blocking for supports for toilet compartments.
2. Division 09 Section “Tile” for wall finish around toilet compartments.
3. Division 10 Section “Toilet Room Accessories” for toilet tissue dispensers, seat cover dispensers, grab bars, and similar accessories.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, and finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment material indicated.

D. Samples for Verification: Of each type of color and finish required for units, prepared on not less than 4-inch square Samples of same thickness and material indicated for Work.

E. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate requirements for blocking and reinforcement for wall anchorage of toilet compartments and urinal screens with wall framing.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments 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 dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 ACCESSIBILITY REQUIREMENTS

A. Accessible Regulatory Requirements: Toilet compartments and urinal screens designated as being accessible to persons using wheelchairs shall comply with applicable provisions of the 2010 ADA Standards for Accessible Design, ICC/ANSI A117.1, and the 2022 California Building Code with latest Supplement(s).

B. Wheelchair accessible toilet compartments shall have minimum clear dimensions as follows:

1. Compartment Width: 60 inches.
2. Compartment Length: As required to provide the following clear spaces and/or clearances:
    a. Clear Space from Rear Wall: Clear space measured from the rear wall; clear space shall include the water closet, no doors may swing into this clear space:
        1) Wall Mounted Water Closets: 56 inches.
        2) Floor Mounted Water Closets: 59 inches.
        3) Children’s Compartments: 59 inches for wall mounted and floor mounted water closets.
    b. Clear space in front of water closets:
        1) End opening stalls: 48 inches.
        2) Side opening stalls: 60 inches.
    c. Additional clearance as may be required for door pull side strike edge clearance.
3. Door Widths: Clear widths as follows:
        1) End opening stalls: 32 inches.
        2) Side opening stall: 34 inches.
4. Door Maneuvering Clearances, Location, and Hardware:
    a. Pull Side Clearances:

1) Pull side strike edge clearance: 18 inches measured from the strike edge of the door in a closed position.
2) Pull Side Clearance Perpendicular to Door: 60 inches from the door in a closed position.

b. Push Side Clearance Perpendicular to Door: 48 inches from the face of the door in a closed position.
c. Maximum distance from edge of door opening to adjacent intersecting wall or partition panel: 4 inches.
d. Doors located at end opening stalls shall be located in front of the open space adjacent to the side of the water closet.
e. Door Operating Hardware:

1) Doors shall be self-closing (gravity hinge).
2) An accessible pull shall be located on each side of the door near the latch.
3) Operating hardware and pulls shall be located between 34 and 44 inches above the floor.
4) Operable hardware shall be operable with one hand and not require tight grasping, pinching, or twisting of the wrist. The force to operate hardware shall not exceed a 5 pound force.

5. Toe Clearance: Partitions shall have toe clearance of 12 inches minimum measured from the floor to the bottom of partition panels, exclusive of support members.
6. Width of Accessible Route to Compartments: 44 inches.

C. Screens at Wheelchair Accessible Urinals: 36 inches minimum clear width.

2.2 SOLID POLYMER TOILET COMPARTMENTS AND SCREENS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Accurate Partitions Corporation.
2. General Partitions Mfg. Corp.
3. Scranton Products (Capitol/Comtec/Santana).

B. Toilet Enclosure Style: Floor anchored, overhead braced.

C. Urinal Screen Style: Wall supported at one end with a pilaster and overhead bracing or post at the opposite end.

D. Doors, Panels, and Pilasters: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, and with homogenous color and pattern throughout thickness of material.

1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.

2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer doors and panels to prevent burning.
3. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.

E. Pilaster Shoes: Manufacturer's standard design; stainless steel, 3-inches high.

F. Wall Brackets for Compartments: Manufacturer's continuous full height aluminum with bright dipped anodized finish wall brackets.

1. Profile: Double-ear profile unless single-ear, U-shaped or H-shaped profile is required for project conditions.

G. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in bright dipped anodized finish.

1. Wall Brackets for Headrails: 16 gage stainless steel.
2. End caps for Headrails: Manufacturer’s standard aluminum caps.

H. Floor Supports: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

I. Fasteners: All fasteners shall be stainless steel. Exposed fasteners shall have theft-resistant-type heads. Provide sex-type bolts for through-bolt applications.

1. Fasteners for Floor and Wall Connections:

a. Metal Stud Framed Walls: No. 14 self-tapping sheet metal screw by length required to penetrate 1-inch beyond metal framing.
b. Concrete or Masonry Floors and Walls: Self-threading type masonry screws installed into pre-drilled holes, Hilti Kwik-Con II or equivalent, 1/4-inch diameter by 2-3/4 inches long with Torx hex washer head, stainless steel.

2.3 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories as follows:

1. Hinges: Heavy duty extruded aluminum hinges, 8-inches in length, with wrap-around flanges, through bolted to pilasters and door panels with sex bolts. Hinges shall be self-closing type (gravity hinge) that can be adjusted to hold doors open at any angle up to 90 degrees.
2. Latch and Keeper: Surface-mounted heavy duty extruded aluminum latch and keeper unit designed for emergency access and with combination rubber-faced door strike and keeper secured to doors and panels with sex bolts. Strikes shall be a minimum of 6-inches long. Slide bolts shall have a black anodized finish.

a. Accessible Stalls: Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to persons with disabilities. Latches shall be flip-over style, sliding, or other hardware not requiring the user to grasp or twist.

3. Door Bumpers and Coat Hooks:

a. In-Swinging Doors: Manufacturer's standard chrome plated Zamac rubber-tipped combination coat hook and bumper, sized to prevent door from hitting compartment-mounted accessories, wall, or partition; 4 inch maximum projection; provide one at each in swinging door.
b. Out-Swinging Doors: Coat hook only, 1-1/2 inch maximum projection, mount at 46 inches maximum above the floor on the stall side of the door; Bobrick B-233 or equivalent.

4. Door Pulls: Manufacturer's standard chrome plated Zamac door pulls, provide door pulls on the pull side of compartment doors.

a. Accessible Stalls and Ambulatory Accessible Stalls: Provide an accessible door pull on each side of doors near the latch at compartments indicated to be accessible to persons with disabilities. Door pulls shall be loop or U-shape complying with accessibility requirements of authorities having jurisdiction.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

C. Material Finishes, General: Provide hardware and accessories having the finishes indicated for the following materials:

1. Aluminum: Bright dipped anodized aluminum.
2. Stainless Steel: Satin finish.
3. Zamac: Chrome-plated, nonferrous, cast zinc alloy (zamac).

a. Zamac shall only be allowed for pulls, door bumpers, and combination coat hook/door bumpers.

2.4 FABRICATION

A. General: Provide panels of sizes indicated and as required for project conditions. Machine edges to have radius of 1/4-inch. Exposed panel surfaces shall be free of saw marks, cuts, nicks or other damage.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Door and Panel Heights: Doors and panels shall be fabricated in 55-inch heights (Bottom of panel to top of panel).

D. Pilaster Heights: 82-inches.

E. Urinal Screens: Urinal screens shall be fabricated in 50-inch panel heights by 21-inches in depth.

F. Continuous Wall Brackets: Continuous wall brackets shall be cut to lengths one inch less than panel heights.

G. Door Size and Swing: Unless otherwise indicated, provide doors as follows:

1. Standard, Non-Accessible Stalls: 24-inch wide in-swinging doors.
2. Wheelchair Accessible Stalls: 36-inch-wide doors with a minimum 34-inch wide clear opening; doors shall be in-swinging or out-swinging as indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.
2. Accurately measure toilet rooms receiving compartments and locations of fixtures.

B. Proceed with installation only after unsatisfactory conditions have been corrected; commencement of work constitutes acceptance of conditions.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices in compliance with the specifications.

1. Maximum Clearances:

a. Pilasters to Panels: 1/4 inch.
b. Panels to Walls: 1 inch.

2. Comply with referenced regulatory requirements for compartments and screens to be installed at water closets and urinals indicated to be accessible.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Head rails shall be cross braced with intersecting head rails spaced not more than 6 feet on center and aligned with the panels below. Install doors and panels with top edges level and aligned, adjust doors so tops of doors are parallel with overhead bracing when doors

are in a closed position. Doors, panels and screens shall be installed with the bottom edge approximately 14-inches above the floor (approximate dimension for accommodation of floor slope).

C. Urinal Screens: Attach screens to wall with continuous wall bracket at one end and to pilaster or post support at opposite end. Set units level and plumb and to resist lateral impact.

1. Mounting height and wall projection of urinal screens shall comply with 2019 CBC Section 1209.3.2:

a. Bottom of Screen from Floor: 12 inches maximum.
b. Top of Screen from Floor: 60 inches minimum.
c. Projection from Wall: 18 inches minimum and not less than 6 inches minimum beyond the outermost lip of the urinal.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges to return doors to a fully closed position unless otherwise noted.

END OF SECTION

SECTION 102600
WALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Stainless steel corner guards.

B. Related Sections:

1. Division 08 Section "Door Hardware" for metal armor, kick, mop, and push plates for doors.

1.3 SUBMITTALS

A. 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.

B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Corner Guards: 12 inches long.

D. 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 resilient products under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

E. Warranty: Sample of special warranty for resilient products.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store 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. Store products either in a vertical or horizontal position as indicated by the manufacturer.
3. Keep plastic materials out of direct sunlight.
4. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

1.5 FIELD 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.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
    b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of wall protection products from a single source from a single manufacturer.

2.2 STAINLESS STEEL GUARDS

A. Corner Guards, Stainless Steel, Surface-Mounted: Fabricated as one-piece from formed metal with formed edges with 90 or 135-degree turn to match wall condition.

1. Material: Stainless steel, Type 304.
    a. Thickness: Minimum 0.0625 inch.
    b. Finish: Directional satin, No. 4.
2. Wing Size: Nominal 2-1/2 by 2-1/2 inches.
3. Length: As indicated on Drawings.
4. Corner Radius: 1/8 inch.
5. Edges: Beveled.
6. Mounting: Oval head, countersunk screws through factory-drilled mounting holes.

B. End Wall Guards, Stainless Steel, Surface-Mounted: Fabricated as one-piece from formed metal, U-shaped with formed edges that covers entire end of wall.

1. Material: Stainless steel, Type 304.
    a. Thickness: Minimum 0.0625 inch.
    b. Finish: Directional satin, No. 4.
2. Wing Size: Nominal 2-1/2 by 2-1/2 inches.
3. Length: 48 inches.
4. Corner Radius: 1/8 inch.
5. Edges: Beveled.
6. Mounting: Oval head, countersunk screws through factory-drilled mounting holes.

2.3 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M.

B. Vinyl/Acrylic Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded and sheet material, thickness as indicated.

1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
2. Chemical and Stain Resistance: Tested according to ASTM D 1308.
3. Self-extinguishing when tested according to ASTM D 635.
4. Flame-Spread Index: 25 or less.
5. Smoke-Developed Index: 450 or less.

C. Aluminum Extrusions: 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 B 221 (ASTM B 221M) for Alloy 6063-T5.

D. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

2.4 FABRICATION

A. Fabricate wall protection units 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire ratings, and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. 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.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting and priming, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install wall protection products according to manufacturer’s written instructions, 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.

1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings.
2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

a. Where splices occur in horizontal runs, splice retainers and plastic covers at different locations along the run, but no closer than 12 inches.
b. Adjust end, top, and bottom caps as required to ensure tight seams.

3.4 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.

END OF SECTION

SECTION 102800
TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following:

1. Toilet room accessories.
2. Diaper Changing Stations.
3. Custodial accessories.
4. Warm-air dryers.
5. Under-lavatory guards.

B. Owner-Furnished Accessories: Owner-furnished Contractor installed accessories are scheduled at the end of this Section in Part 3 Article “Owner Furnished, Contractor Installed Accessories.”

C. Related Sections:

1. Division 06 Section “Rough Carpentry” for backing and blocking for supports for accessories.
2. Division 09 Section “Non-Structural Metal Framing” for backing and blocking for supports for toilet compartments.
3. Division 10 Section “Toilet Compartments” for toilet compartments.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

C. Sample Warranty: For manufacturer's special warranty.

D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

C. Coordinate backing for mounting accessories with wall framing.

D. Coordinate electrical power supply for electric power operated accessories.

1.6 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 10 (ten) years from date of Substantial Completion, warranty period as indicated in the Accessory schedule at the end of the Section.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Regulatory Requirements: Toilet room accessories and mounting heights of accessories to be used by persons with disabilities shall comply with accessibility requirements of the 2010 ADA Standards for Accessible Design and the 2022 California Building Code, Chapter 11B, “Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing.”

B. Installation: Where accessories are to be usable by persons with disabilities, comply with regulatory requirements including, but not limited to the following:

1. Where accessories are provided, at least one of each type shall be accessible.
2. Accessories shall be located on an accessible route.
3. The height above the floor to any operating mechanism or point of use shall not exceed 40-inches.
4. Accessories shall not obstruct the use of grab bars for a minimum distance of 12 inches above, 1-1/2 inches below, and/or 1-1/2 inches from the ends of grab bars.
5. Accessories located below 34 inches above the floor shall not project into the clear space required for any plumbing fixture.
6. Accessories with their bottom edge more than 27 inches above the floor shall not project more than 4 inches from the wall.
7. Mirrors located above lavatories or counter tops shall be installed with the bottom edge of the reflecting surface 40 inches maximum above the floor, mirrors not located above lavatories or counter tops shall be installed with the bottom edge of the reflecting surface 35 inches maximum above the floor.
8. Toilet paper dispensers shall not be of a type that controls delivery or that does not allow for continuous paper flow.

2.2 PERFORMANCE REQUIREMENTS

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.

2.3 TOILET ROOM ACCESSORIES

A. Scheduled Accessories: Accessories are scheduled on the Drawings.

1. Basis of Design: Named manufacturers' products indicated in the accessory schedule for each accessory type indicated are for the purpose of establishing minimum requirements. Named products are based on the following manufacturer:

a. Bobrick Washroom Equipment, Inc.

1) Subject to compliance with requirements, provide products indicated or equivalent products by one of the following:

a) American Specialties, Inc.

B. Locks and Keys: Lockable accessories shall be provided with cylindrical locks and all locks shall be keyed alike. Provide each lockable accessory with not less than one key.

C. Finish: Exposed stainless-steel surfaces of accessories shall have a satin finish unless otherwise indicated.

2.4 WARM-AIR DRYERS

A. Warm Air Dryers:

1. Basis-of-Design Product: Drawings and Specifications are based on the following:
    a. Bobrick Corporation; Model TrimLine B-7128.
2. Mounting: Surface.
3. Operation: Electronic-sensor activated with timed power cut-off switch.
    a. Operation Time: 30 to 40 seconds.
4. Cover Material and Finish: Stainless steel, No. 4 finish (satin).
5. Electrical Requirements: 115 V, 13 A, 1240-1450 W.

2.5 DIAPER CHANGING STATIONS

A. Diaper Changing Stations: Horizontal unit that opens by manually folding down from a stored position and designed to support a minimum of 250 lb static load when opened.

1. Basis-of-Design Product: Drawings and Specifications are based on the following:
    a. Koala Kare Products; Model KB200 Horizontal Wall Mounted Baby Changing Station.
        1) Subject to compliance with requirements, provide the named product or a comparable product subject to request for substitution.
2. Mounting: Surface mounted.
3. Projection from Wall: Not more than 4 inches from wall when closed, 24 inches maximum when open.
4. Width: 36 inches nominal.
5. Operation: Manually operated with pneumatic shock-absorbing mechanism for controlled opening and closing.
6. Material and Finish: Injection molded polypropylene having antimicrobial embedded into plastic material, in color selected by Architect from manufacturer's standard colors (Cream, gray, white, light brown).
7. Features and Accessories:
    a. Nylon safety strap at changing table.
    b. Integral hooks for bags or purses, not less than two.
    c. Built-in liner dispenser.
8. Standards: Diaper changing stations to comply with the following:
    a. ASTM F 2285 Standard Safety Performance Specification for Diaper Changing Tables for Commercial Use.
    b. ANSI Z535.4 Product Safety Signs and Labels.
9. Accessibility Requirements: Unit shall comply with requirements of the 2010 ADA Standards for Accessible Design and the 2019 California Building Code.
    a. Operable parts shall be operable with one hand and not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts or pull down the changing table shall not exceed 5 lbs.

b. Knee and Toe Clearance: Width of 30 inches minimum, depth of 19 inches minimum/24 inches maximum, and vertical clearance of 27 inches minimum above the floor.
c. Changing Table Height: 34 inches maximum above the floor.
d. Reach Range: 48 inches maximum above the floor for forward reach range for hand holds to pull down the changing table, 40 inches maximum above the floor to dispenser outlets.

2.6 UNDER-LAVATORY GUARDS

A. Under-lavatory Guard:

1. Basis-of-Design Product: Drawings and Specifications are based on the following:
   a. Truebro, Inc., Lavguard2 series under-lavatory guard.
      1) Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
         a) Plumberex Specialty Products, Inc.
2. Description: Antimicrobial, white molded-plastic under-lavatory guard assemblies. Under-lavatory guard assemblies shall cover waste piping and hot and cold water supply piping, allow service access without removing coverings, and shall prevent contact with hot surfaces and/or sharp objects.
3. Locations: Provide under-lavatory guard assemblies at all lavatories and/or sinks in all toilet rooms, and at sinks in cabinets/counter tops that are indicated to be accessible to persons in a wheel chair.

2.7 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304 with satin finish, unless otherwise indicated.

B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel).

D. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

E. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.8 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.
2. Confirm and coordinate mounting heights and locations of support backing for accessories that are to be accessible to persons with disabilities to insure installed accessories will comply with accessibility requirements when installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected; commencement of work constitutes acceptance of conditions.

3.2 INSTALLATION

A. Install accessories according to manufacturers' written instructions and as indicated on Drawings. Use fasteners appropriate for substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Accessories such as grab bars, towel bars, paper dispensers and soap dispensers, provided on or within walls, shall be installed and sealed to protect structural elements from moisture. Sealant shall not be visible in the finished installation. Sealant shall be mildew resistant silicone sealant as specified in Division 7 Section “Joint Sealants.”

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

C. Diaper Changing Stations:

1. Changing Table Height: 34 inches maximum above the floor when deployed.
2. Knee Clearance: 27 inches minimum above the floor.
3. Changing tables located in multi-accommodation toilet rooms, when deployed, shall not obstruct the required width of accessible routes to other accessible fixtures or features within the room (Accessible routes shall be 44 inches minimum in width).

4. Changing tables shall not be located in toilet compartments of multi-accommodation toilet rooms.

3.3 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.4 ACCESSORY LOCATIONS

A. General: Accessories shall be provided at locations indicated on drawings, for locations where accessories are not indicated, provide accessories as follows:

1. Paper Towel Dispensers: Provide one surface mounted paper towel dispenser for each single sink or lavatory location; where multiple sinks or lavatories occur in the same room or area, provide one towel dispenser for every 2 sinks or lavatories.
2. Soap Dispensers: Provide one surface mounted soap dispenser for each sink or lavatory.
3. Toilet Tissue Dispensers: Provide one surface mounted toilet tissue dispenser for each water closet.
4. Seat Cover Dispensers: Provide one surface mounted seat cover dispenser for each water closet.
5. Grab Bars: Provide one 42-inch grab bar at the back of the water closet and one 48-inch grab bar at the side of the water closet for all wheel chair accessible water closets.

3.5 OWNER-FURNISHED; CONTRACTOR-INSTALLED ACCESSORIES

A. The following accessories shall be furnished by the Owner and installed by the Contractor:

1. Toilet Tissue Dispenser.
2. Soap Dispenser.
3. Seat Cover Dispenser.

END OF SECTION

SECTION 104415
FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-fire rated fire extinguisher cabinets for portable fire extinguishers.
2. Portable hand carried fire extinguishers.

1.3 SUBMITTALS

A. 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.

B. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate size of fire extinguisher cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

C. Coordinate blocking and backing for wall anchorage of cabinets with wall framing.

1.5 WARRANTY

A. Special Warranty for Fire Extinguishers: 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 when testing interval required by NFPA 10 is within the warranty period.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from a single source from a single manufacturer.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. J. L. Industries, Inc.; a division of Activar Construction Products Group.
2. Larsen's Manufacturing Company.
3. Potter Roemer LLC.

2.2 PORTABLE FIRE EXTINGUISHERS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers, General: Type, size, and capacity as 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.

C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated, 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

1. Provide at locations where fire extinguishers or fire extinguisher cabinets are indicated except in Kitchens.

D. Wet-Chemical Type: UL-rated 2-A:1-B:C:K, 1.6-gal. nominal capacity, with potassium acetate-based chemical in stainless-steel container; with pressure-indicating gage.

1. Provide one wet-chemical type fire extinguisher in the Kitchen.

2.3 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 black] baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

    a. Orientation: Vertical.

2.4 FIRE EXTINGUISHER CABINETS

A. Cabinet Type: Semi-recessed cabinet with box partially recessed in walls of sufficient depth suitable for fire extinguishers indicated, with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Cabinet Construction: Non-rated.
2. Cabinet Material: Cold-rolled steel sheet.
3. Wall Recess: Cabinet shall require of wall recess of no more than 4 inches.

B. Doors and Trim:

1. Trim Style: Rolled edge trim with 1-1/2-inch or 2-1/2-inch backbend depth as standard with manufacturer.

    a. Projection from Wall: Cabinet, including trim and pull handles, shall not project more than 4 inches from the finished wall surface.

2. Material (Doors and Trim): Cold-rolled steel sheet.
3. Doors:

    a. Style: Vertical duo panel with frame, duo panel adjacent to strike edge of door.
    b. Door Glazing: Tempered float glass (clear).
    c. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

        1) Latch and Pull: Manufacturer’s standard projecting door pull and friction latch.
        2) Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
        3) Hinge: Manufacturer’s standard continuous hinge, of same material and finish as trim permitting door to open 180 degrees.

C. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

D. Identification: Identify fire extinguishers in fire protection cabinets with the words “FIRE EXTINGUISHER” applied to the door.

1. Lettering shall comply with authorities having jurisdiction for letter style, size, spacing, and location.
2. Lettering Application Process: Silk screened or pressure sensitive vinyl letters.
3. Lettering Color: Red.
4. Lettering Orientation: Vertical.

E. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
   a. Finish: Manufacturer’s standard baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
   b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   c. Color: White.

2. Aluminum: ASTM B221 for extruded shapes and aluminum sheet, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet, clear anodic finish.
3. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.5 FABRICATION OF FIRE PROTECTION CABINETS

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 GENERAL FINISH REQUIREMENTS FOR CABINETS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged fire extinguishers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire extinguishers, cabinets, and mounting brackets in locations indicated, and in compliance with requirements of authorities having jurisdiction.

B. Fire Extinguisher Cabinets: Fasten cabinets to structure, square and plumb.

1. Mounting Brackets: Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
2. Mounting Height: Mount cabinets and brackets so that the top of installed fire extinguishers will not exceed 48 inches above the finished floor.

C. Bracket Mounted Fire Extinguishers: Fasten mounting brackets to surfaces, square and plumb.

1. Mounting Height: Mount brackets so that the top of installed fire extinguishers will not exceed 48 inches above the finished floor, and the bottom of extinguishers will not be more than 26-1/2 inches above the floor.

D. Identification: Apply identification lettering at locations indicated or as required by authorities having jurisdiction.

3.4 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.

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 133419
METAL BUILDING SYSTEMS ERECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Metal building system including the following:

1. Structural-steel framing.
2. Metal roof panels.
3. Accessories and trim.

B. Related Sections include but are not limited to:

1. Division 01 Section “Quality Requirements” for additional quality assurance and testing requirements.
2. Division 07 Sections for Insulation.
3. Division 08 Sections for Doors and Windows.

1.3 DEFINITIONS

A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

B. Metal Building Manufacturer (MBM): Metal building system manufacturer’s authorized agent or representative responsible for the design and construction of the metal building system.

1.4 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of manufactured product to be incorporated into the metal building system. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes; include product data for the following:

1. Structural-steel-framing system.
2. Metal roof panels.
3. Metal wall panels.
4. Flashing and trim.
5. Accessories.
6. Thermal insulation and vapor-retarder facings.
7. Windows.

B. Shop Drawings: For the following metal building system framing components. Include plans, elevations, sections, details, and attachments to other work.

1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
3. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners. Show roof-mounted items including equipment supports, pipe supports and penetrations, and items mounted on roof curbs.
4. Accessory Drawings: Include details for flashing and trim, gutters, downspouts, and vents at a scale of not less than 1-1/2 inches per 12 inches:

C. Samples for Initial Selection: For item with factory-applied color finish.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Metal Roof and Wall Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.

E. Delegated-Design Submittal/Governing Agency Approval: Metal building system manufacturer shall provide a delegated design submittal for the metal building system for Contractors submission to the governing agency; delegated design submittal must be approved by the governing agency prior to the start of construction.

1. Submittal shall include necessary drawings, plans, elevations, sections, details of metal building system, fabrication and installation requirements, anchorage

details, and structural calculations prepared, stamped, and signed by a structural or civil engineer licensed in the State of California. The metal building manufacturer shall be responsible for the design and engineering calculations, the drawings, and for responding to and resolving any comments or issues generated by governing agency.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified steel erector and metal roof and wall panel installer.

B. Welding certificates.

C. Metal Building System Certificate: For metal building system, from manufacturer.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

a. Name and location of Project.
b. Order number.
c. Name of manufacturer.
d. Name of Contractor.
e. Building dimensions including width, length, height, and roof slope.
f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
g. Governing building code and year of edition.
h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

D. Erector Certificates: For each product, from manufacturer.

E. Manufacturer Certificates: For each product, from manufacturer.

F. Material Test Reports: For each of the following products:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

G. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer and member of MBMA, and registered and approved by authorities having jurisdiction to perform fabrication work without special inspection.

1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer licensed in the State of California.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Metal Roof and Wall Panel Installer Qualifications: An experienced installer who specializes installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

D. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

F. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.

G. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

H. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Contractor, metal roof and wall panel Installer, metal roof and wall panel manufacturer's representative, and installers whose work interfaces with or affects metal roof and wall panels including installers of doors, windows, roof accessories, and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.
6. Review methods and procedures related to metal building systems including, but not limited to, the following:

    a. Condition of foundations and other preparatory work performed by other trades.
    b. Structural load limitations.
    c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
    d. Required tests, inspections, and certifications.
    e. Unfavorable weather and forecasted weather conditions.

7. Review methods and procedures related to metal roof and wall panel assemblies including, but not limited to, the following:

    a. Compliance with requirements for framing and support conditions, including alignment, flatness, and attachment to structural members.
    b. Structural limitations of framing members during and after panel installation.
    c. Flashings, special details, roof drainage, penetrations, equipment curbs, and condition of other construction that will affect metal panels.
    d. Temporary protection requirements for metal panel assembly during and after installation.
    e. Observation and repair after metal panel installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weather tight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements:

1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
2. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.11 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section “Cast-in-Place Concrete.”

B. Coordinate installation of thermal insulation, roof curbs, equipment supports, and roof penetrations.

C. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leak proof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Special Weather tightness Warranty for Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that leak or otherwise fail to remain weather tight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Metal building system shall be designed by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings and not less than required by ASCE/SEI 7.

2. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to the California Building Code and ASCE/SEI 7-10.

a. Seismic Design Criteria: As indicated on Drawings.

3. Wind Load: As indicated on Drawings.

C. Thermal Movements: 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 joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces.

D. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at negative test-pressure difference of 1.57 lbf/sq. ft.

E. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at static-air-pressure difference of 1.57 lbf/sq. ft.

F. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 2.86 lbf/sq. ft.

G. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a wind-load design pressure of not less than 2.86 lbf/sq. ft.

H. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

I. Energy Performance: Provide roof panels with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC.

2.2 METAL BUILDING SYSTEM

A. Description: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

1. Provide metal building system of size and with bay spacings, roof slopes, and spans indicated on Drawings.

B. Primary-Frame Type: Rigid clear span; solid-member, structural-framing system without interior columns.

C. Secondary-Frame Type: Manufacturer's standard purlins, joists, and girts.

D. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.

E. Eave Height: Manufacturer's standard height, as indicated by nominal height on Drawings.

F. Bay Spacing: As indicated on Drawings.

G. Roof Slope: As indicated on Drawings; 1 inch per 12 inches minimum.

H. Roof System: Manufacturer's standard trapezoidal-rib, standing-seam metal roof panels.

I. Exterior Wall System: As indicated on Drawings.

2.3 STRUCTURAL-STEEL FRAMING

A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
3. Exterior Column Type: Uniform depth or tapered.

4. Rafter Type: Uniform depth or tapered.

B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly.

C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:

1. Purlins and Girts: C or Z-shaped sections with minimum 2-1/2-inch wide flanges with stiffening lips angled 40 to 50 degrees from flange. Depth as required to comply with system performance requirements.
2. Eave Struts: Unequal-flange C-shaped sections to provide adequate backup for metal panels.
3. Flange Bracing: Minimum 2-by-2-by-1/8-inchstructural-steel angles.
4. Sag Bracing: Minimum 1-by-1-by-1/8-inchstructural-steel angles.
5. Base or Sill Angles: Minimum 3-by-2-inch zinc-coated (galvanized) steel sheet.
6. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
7. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
8. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

D. Wind Bracing: Steel rods, ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50; minimum 1/2-inchdiameter steel; threaded full length or threaded a minimum of 6 inches at each end.

1. Rigid Portal Frames: Where indicated on Drawings, provide rigid portal frames fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.

E. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide zinc-plated or hot-dip galvanized bolts for structural-framing components that are galvanized.

F. Steel Materials:

1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70.
7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80, or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80; with G60 coating designation; mill phosphatized.
8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

    a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 (230 through 550), or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.

9. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), carbon-steel, hex-head bolts; ASTM A 563 (ASTM A 563M) carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers. Finish, hot-dip zinc coating, ASTM A 153/A 153M, Class C.
10. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers. Finish, hot-dip zinc coating, ASTM A 153/A 153M, Class C.
11. Unheaded Anchor Rods: ASTM F 1554, Grade 36.

    a. Configuration: Straight.
    b. Nuts: ASTM A 563 hex carbon steel.
    c. Plate Washers: ASTM A 36/A 36M carbon steel.
    d. Washers: ASTM F 436 hardened carbon steel.
    e. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

12. Headed Anchor Rods: ASTM F 1554, Grade 36.

    a. Configuration: Straight.
    b. Nuts: ASTM A 563.
    c. Plate Washers: ASTM A 36/A 36M carbon steel.
    d. Washers: ASTM F 436.
    e. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

13. Threaded Rods: ASTM A 193/A 193M, Grade 50.

    a. Nuts: ASTM A 563 (ASTM A 563M) hex carbon steel.
    b. Washers: ASTM F 436hardened carbon steel.
    c. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.

1. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.

    a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

2. Prime galvanized members with specified primer after phosphoric acid pretreatment.
3. Primer: Manufacturer’s standard.

2.4 METAL ROOF PANELS

A. Trapezoidal-Rib, Standing-Seam Metal Roof Panels: Panels formed with raised trapezoidal ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.

1. Material: Zinc-coated (galvanized) steel sheet, 0.028-inch (24 gage) nominal thickness.

    a. Exterior Finish: Fluoropolymer.
    b. Color: As selected by Architect from manufacturer's full range.

2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from zinc-coated (galvanized) steel sheet.
3. Joint Type: Mechanically seamed, [folded according to manufacturer's standard.
4. Panel Coverage: 24 inches.
5. Panel Height: 3 inches.
6. Uplift Rating: UL 90.

2.5 METAL WALL PANELS

A. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) steel sheet, 0.028-inch (24 gage) nominal thickness.

    a. Exterior Finish: Fluoropolymer.
    b. Color: As selected by Architect from manufacturer's full range.

2. Major-Rib Spacing: 12 inches on center.
3. Panel Coverage: 36 inches.
4. Panel Height: Manufacturer’s standard, 1 inch minimum, 1-1/2 inch maximum.

2.6 METAL PANEL MATERIAL AND FINISHES

A. Material: Restricted-flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
2. Surface: Smooth, flat finish.

B. Exposed Coil-Coated Finish: AAMA 621 Three-coat fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

C. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.7 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inchthick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weather tight construction.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants,

gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inchthick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weather tight construction.

D. Flashing and Trim: Formed from 0.028-inch (24 gage) nominal thickness, metallic-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.

1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.

E. Gutters: Formed from not less than 0.028-inch (24 gage) nominal-thickness, metallic-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inchlong sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Bronze, copper, or aluminum wire ball type.

F. Downspouts: Formed from not less than 0.028-inch (24 gage) nominal-thickness, zinc-coated (galvanized) steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-footlong sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Roof Curbs: Fabricated from minimum 0.052-inch nominal-thickness, metallic-coated steel sheet prepainted with coil coating; finished to match metal roof panels; with welded top box and bottom skirt, and integral full-length cricket; capable of withstanding loads of size and height indicated.

1. Curb Subframing: Fabricated from 0.064-inch nominal-thickness, angle-, C-, or Z-shaped metallic-coated steel sheet.
2. Insulation: 1-inch thick, rigid type.

H. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

I. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads

matching color of materials being fastened by means of plastic caps or factory-applied coating.

1. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
2. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with EPDM sealing washers bearing on weather side of metal panels.
3. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
4. Blind Fasteners: Stainless-steel rivets.

J. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

K. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

L. Metal Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
2. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weather tight; and as recommended by metal building system manufacturer.

2.8 SOURCE QUALITY CONTROL

A. Special shop inspections will not be required, manufacturer shall be registered and approved by authorities having jurisdiction to perform such Work without special inspection.

1. After fabrication, submit certificate of compliance with copy to authorities having jurisdiction certifying that Work was performed according to Contract requirements.

2.9 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with base plates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with base plates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before erection proceeds, survey elevations and locations of concrete bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive

structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.

a. Joint Type: Snug tightened or pretensioned.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

I. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.

1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.

B. Coordination: Coordinate installation of metal roof and wall panels with roof curbs, insulation system, door frames, windows, service doors, flashing and trim, and similar items.

C. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes. Field cutting of metal panels by torch is not permitted.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

D. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weather tight enclosure. Avoid "panel creep" or application not true to line.

E. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

F. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

1. Install ridge caps as metal roof panel work proceeds.
2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.

1. Install clips to supports with self-drilling or self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels for fasteners.
5. Provide metal closures at rake edges, rake walls, ridges, and each side of ridge caps.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.6 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
4. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
5. Install screw fasteners in predrilled holes.
6. Install flashing and trim as metal wall panel work proceeds.
7. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
8. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
9. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

3.7 THERMAL INSULATION INSTALLATION

A. Thermal insulation shall be installed in accordance with requirements of Division 07 Section “Thermal and Acoustical Batt Insulation.”

3.8 DOOR AND WINDOW FRAME INSTALLATION

A. Door and window frames shall be installed in accordance applicable Division 08 Sections; coordinate installation of door and window frames with metal roof and wall panels, and flashing and trim.

3.9 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weather tight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Coordinate installation of flashing and trim with roof curbs, door frames, windows, service doors, and similar items.
2. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
3. 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 or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches on center using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inchtelescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top

and bottom and at approximately 60 inches on center in between. Provide elbows at base of downspouts to direct water away from building.

E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. High-Strength, Field-Bolted Connections: Connections shall be tested and inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:

    a. Liquid Penetrant Inspection: ASTM E 165.
    b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    c. Ultrasonic Inspection: ASTM E 164.
    d. Radiographic Inspection: ASTM E 94.

C. Product will be considered defective if it does not pass tests and inspections.

3.11 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing and accessories.

1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 220000

GENERAL PLUMBING PROVISIONS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. The preceding General Conditions shall form a part of this Section with the same force and effect as though repeated here. The provisions of this Section shall also apply to Division 22 of these Specifications and shall be considered a part of that Divisions.

1.2 CODES AND REGULATIONS

A. All work and materials shall be in accordance with current rules and regulations of applicable codes. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes. Should the Drawings or Specifications call for material or methods of construction of a higher quality or standard than required by these codes, the Drawings and Specifications shall govern. Applicable codes and regulations include, but are not necessarily limited to, the following:

California Building Code	CCR Title 24, Part 2
California Electrical Code	CCR Title 24, Part 3
California Mechanical Code	CCR Title 24, Part 4
California Plumbing Code	CCR Title 24, Part 5
California Energy Code	CCR Title 24, Part 6
California Fire Code	CCR Title 24, Part 9
Local Codes	

1.3 DEFINITIONS

A. Provide: The term "provide" as used in these specifications or on the drawings shall mean furnish and install.

B. Piping: The term "piping" as used in these specifications or on the drawings shall mean all pipe, fittings, valves, hangers, insulation, etc. as may be required for a complete and functional system.

C. Ductwork: The terms "duct" or "ductwork" as used in these specifications or on the drawings shall mean all ducts, fittings, joints, dampers, hangers, insulation, etc. as may be required for a complete and functional system.

D. Wiring: The term "wiring" as used in these specifications or on the drawings shall mean all wiring, conduit, boxes, connections, transformers, relays, switches etc. as may be required for a complete and functional system.

1.4 PERMITS AND FEES

A. The Contractor shall take out all permits and arrange for all tests in connection with his work as required. All charges are to be included in the work.

1.5 COORDINATION OF WORK

A. Examination: Before starting work, thoroughly examine existing and newly completed underlying and adjoining work and conditions on which the installation of this work depends. Report to the Engineer in writing all conditions which might adversely affect this work.

B. Layout: Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. Some work may be shown offset for clarity. The actual locations of all materials, piping, ductwork, fixtures, equipment, supports, etc. shall be carefully planned prior to installation of any work in order to avoid all interference with each other, or with structural, electrical, architectural or other elements.

C. Verification: If discrepancies are discovered between drawing and specification requirements, the more stringent requirement shall apply. All conflicts shall be called to the attention of the Engineer prior to the installation of any work or the ordering of any equipment. No work shall be prefabricated or installed prior to this coordination. No costs will be allowed to the Contractor for any prefabrication or installation performed prior to this coordination. Verify the proper voltage and phase of all equipment with the electrical plans.

D. Location of Utilities Prior to Trenching or Earthwork: The Contractor shall notify the Owner a minimum of two business days prior to beginning trenching or earthwork. Prior to this notification, the Contractor shall have marked all proposed trenches with paint and shall have contacted a utility locating company and have had this company mark all found underground utilities with paint. The Contractor shall then coordinate and arrange for a site visit with the Owner to review the proposed trenching and/or earthwork areas. Trenching and/or earthwork shall not begin until the Owner agrees. Repair and/or compensation for repair of marked utilities is the responsibility of the Contractor. The Owner retains the right to either self-perform the repair or require the Contractor to complete the repair, as directed by the Owner. If while performing the work, the Contractor discovers utilities that have not been marked, the Contractor shall immediately notify the Owner verbally and in writing.

1.6 GUARANTEE

A. Guarantee shall be in accordance with the General Conditions. The Contractor shall repair any defects due to faulty materials or workmanship and pay for any resulting damage to other work which appears within the guarantee period. These Specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with

guarantee periods in excess of that called for in the General Conditions, the certificate of guarantee shall be furnished to the Owner through the Engineer.

1.7 QUIETNESS

A. Piping, ductwork and equipment shall be arranged and supported so that vibration is a minimum and is not transmitted to the structure.

1.8 DAMAGES BY LEAKS

A. The Contractor shall be responsible for damages caused by leaks in the temporary or permanent piping systems prior to completion of work and during the period of the guarantee, and for damages caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

1.9 EXAMINATION OF SITE

A. The Contractor shall examine the site, compare it with Plans and Specifications, and shall have satisfied himself as to the conditions under which the work is to be performed. No allowance shall subsequently be made in his behalf for any extra expense to which he may be put due to failure or neglect on his part to make such an examination.

1.10 COMPATIBILITY WITH EXISTING SYSTEMS

A. Any work which is done as an addition, expansion or remodel of an existing system shall be compatible with that system.

1.11 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new unless otherwise noted. Materials and equipment of a given type shall be by the same manufacturer. Materials and equipment shall be free of dents, scratches, marks, shipping tags and all defacing features at time of project acceptance. Materials and equipment shall be covered or otherwise protected during construction as required to maintain the material and equipment in new factory condition until project acceptance.

1.12 SUBMITTALS

A. Shop Drawings: Within 30 days of contract award, the Contractor shall submit six copies of shop drawings for all materials, equipment, etc. proposed for use on this project. Material or equipment shall not be ordered or installed until written review is processed by the Engineer.

All shop drawings must comply with the following:

1. Shop drawings are required for all material and equipment items and shall include manufacturer's name and catalog numbers, dimensions, capacities, performance curves, and all other characteristics and accessories as listed in the specifications or on the drawings. Descriptive literature shall be current factory brochures and submittal sheets. Capacities shall be certified by the factory. FAX submittals are not acceptable.

2. All shop drawings shall be submitted at one time in a neat and orderly fashion in a suitable binder with title sheet including Project, Engineer and Contractor, table of contents, and indexed tabs dividing each group of materials or item of equipment. All items shall be identified by the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on drawings.

3. All capacities, characteristics, and accessories called for in the specifications or on the drawings shall be high-lighted, circled or underlined on the shop drawings. Calculations and other detailed data indicating how the item was selected shall be included for items that are not scheduled. Data must be complete enough to permit detailed comparison of every significant characteristic which is specified, scheduled or detailed.

B. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and features desired. Proposed substitutions shall comply with the Owner’s General Requirements. Calculations and other detailed data indicating how the item was selected shall be included. The Contractor shall assume full responsibility that substituted items or procedures will meet the specifications and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items. At the Engineer's request, furnish locations where equipment similar to the substituted equipment is installed and operating along with the user's phone numbers and contact person. Satisfactory operation and service history will be considered in the acceptance or rejection of the proposed substitution.

C. Review: Submittals will be reviewed for general conformance with the design concept, but this review does not guarantee quantity shown, nor does it supersede the responsibility of the Contractor to provide all materials, equipment and installation in accordance with the drawings and specifications. The Contractor shall agree that shop drawing submittals processed by the Engineer are not Change Orders; that the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. The Contractor shall agree that if deviations, discrepancies or conflicts between shop drawings and design drawings and specifications are discovered either prior to or after shop drawing submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed. If a resubmittal is required, submit a complete copy of the Engineer's review letter requiring such with the resubmittal.

1.13 MANUFACTURER'S RECOMMENDATIONS

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site through the construction of the project.

1.14 SCHEDULING OF WORK

A. All work shall be scheduled subject to the review of the Engineer and the Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work contracted for as rapidly as possible consistent with good work, and shall cause no delay to other Contractors engaged upon this project or to the Owner. HVAC equipment and functions, whether existing or new, shall be maintained in operating condition whenever the facility is occupied, unless otherwise approved by the Owner.

1.15 DEMOLITION

A. Existing equipment, ducts, piping, etc. noted for removal shall be removed and delivered to the Owner at a location to be determined by the Owner. Those items determined by the Owner to be of no value shall become the property of the Contractor and shall be removed from the job site by the Contractor at the Contractor's expense. Existing piping, ducts, services, etc. requiring capping shall be capped below floors, behind walls, above ceilings or above roof unless otherwise noted. Where items are removed, patch the surfaces to match the existing surfaces.

1.16 HAZARDOUS MATERIAL REMOVAL

A. All hazardous material removal will be by the Owner. Hazardous material is to be removed before the work is started. If the Contractor discovers hazardous material which has not been removed, the Contractor shall immediately cease work in that area and promptly notify the Owner.

1.17 OPENINGS, CUTTING AND PATCHING

A. The locations and dimensions for openings through walls, floors, ceilings, foundations, footings, etc. required to accomplish the work under this Specification Division shall be provided under this Division. Except as noted below, the actual openings and the required cutting and patching shall be provided by other Divisions. Coring through existing concrete or masonry walls, floors, ceilings, foundations, footings, etc., and saw cutting of concrete floors or asphaltic concrete required to accomplish the work under this Specification Division shall be provided

under this Division. Patching of these surfaces shall be provided by other Divisions. Cutting or coring shall not impair the strength of the structure. Any damage resulting from this work shall be repaired at the Contractor's expense to the satisfaction of the Engineer.

1.18 EXCAVATION AND BACKFILL

A. General: Barrel of pipe shall have uniform support on sand bed. Sand shall be free from clay or organic material, suitable for the purpose intended and shall be of such size that 90 percent to 100 percent will pass a No. 4 sieve and not more than 5 percent will pass a No. 200 sieve. Unless otherwise noted, minimum earth cover above top of pipe or tubing outside building walls shall be 24", not including base and paving in paved areas.

B. Excavation: Width of trench at top of pipe shall be minimum of 16", plus the outside diameter of the pipe. Provide all shoring required by site conditions. Where over excavation occurs, provide compacted sand backfill to pipe bottom. Where groundwater is encountered, remove to keep excavation dry, using well points and pumps as required.

C. Backfill:

1. 6" Below, Around, and to 12" Above Pipe: Material shall be sand. Place carefully around and on top of pipe, taking care not to disturb piping, consolidate with vibrator.

2. One Foot Above Pipe to Grade: Material shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.

D. Compaction: Compact to density of 95% within building and under walkways, driveways, traffic areas, paved areas, etc. and to 90% elsewhere. Demonstrate proper compaction by testing at top, bottom and one-half of the trench depth. Perform these tests at three locations per 100' of trench.

1.19 CONTINUITY OF SERVICES

A. Existing services and systems shall be maintained except for short intervals when connections are made. The Contractor shall be responsible for interruptions of services and shall repair damage done to any existing service caused by the work. If utilities not indicated on the drawings are uncovered during excavation, the Contractor shall notify the Engineer immediately.

1.20 PROTECTIVE COATING FOR UNDERGROUND PIPING

A. All ferrous pipe below grade (except cast iron) shall have a factory applied protective coating of extruded high density polyethylene, 35 to 70 mils total

thickness, X-Tru-Coat, Scotchkote. All fittings and areas of damaged coating shall be covered with two layer double wrap of 10 mil polyvinyl tape to total thickness of 40 mils. John-Mansville. Protective coating shall be extended 6" above surrounding grade.

1.21 ACCESS DOORS

A. Provide access doors as required where equipment, piping, valves, ductwork, etc. are not otherwise accessible. Access doors shall match the wall or ceiling finish and fire rating as indicated on the Architectural drawings. 16-gage steel frame and 14-gage steel door with paintable finish, except in ceramic tile, where door shall be 16-gage stainless steel with satin finish. Continuous hinge. Deliver doors to the General Contractor for installation. Milcor. Unless otherwise noted, the minimum sizes shall be as follows:

1 valve up to 1-1/2"	12" x 12"
1 valve up to 3"	16" x 16"

1.22 CONCRETE ANCHORS

A. Steel stud with expansion wedge requiring a drilled hole – powder driven anchors are not acceptable. Minimum spacing shall be 12 diameters center to center and 10 diameters center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80% of the ICC Evaluation Service Report (ESR) values. Minimum concrete embedment shall be the nominal embedment listed in the ESR table. Hilti Kwik Bolt TZ.

1.23 EQUIPMENT ANCHORING AND OTHER SUPPORTS

A. Mechanical systems (equipment, ductwork, piping, conduit, etc.) shall be anchored in accordance with the CBC. All systems mounted on concrete shall be secured with a concrete anchor at each mounting point. All air handlers shall be mounted on spring isolators. Secure base plate as indicated above. Attachment of equipment, ductwork, piping, conduit, etc. supported on curbs or platforms shall be made to the side of curbs and platforms, where possible. Where screws or lag bolts must be installed through the top of a sheet metal cap, the installation shall be as follows. Pre-drill pilot hole. Fill pilot hole with polyurethane sealant. Install screw or lag bolt with a flat washer and an EPDM washer adjacent to the sheet metal.

1.24 SUPPORTS AND SEISMIC RESTRAINTS

A. Any structural element required to hang or support piping, ducts or equipment provided under this Division and not shown on other drawings shall be provided under this Division.

B. Mechanical systems (equipment, ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance with the CBC. Submit anchorage calculations and details stamped and signed by a structural engineer registered in the State of California. Submit shop drawings showing location, type and detail of restraints. Submit manufacturer's data for restraints. Restraint system shall be Mason West, Inc. (OSHPD OPM 0043-13).

1.25 PAINTING

A. Paint all black iron supports, hangers, anchors, etc. with two coats of rust resisting primer. Also paint all uninsulated black iron piping exposed to weather with two coats of rust resisting primer.

1.26 ROOF PENETRATIONS AND PATCHING

A. Whenever any part of the mechanical systems penetrates the roof or exterior wall, the openings shall be flashed and counter-flashed water tight with minimum 22 gauge galvanized sheet metal. Flashing shall extend not less than eight inches from the duct, pipe, or supporting member in all directions unless detailed otherwise. All roof penetrations and patching shall be in accordance with the recommendations of the National Roofing Contractor's Association and the Owner's roofing standards.

1.27 SYSTEM IDENTIFICATION

A. Above Grade Piping: Provide markers on piping which is either exposed or concealed in accessible spaces. For piping systems, other than drain and vent lines, indicate the fluid conveyed or its abbreviation, either by pre-printed markers or stenciled marking, and include arrows to show direction of flow. Pre-printed markers shall be the type that wrap completely around the pipe, requiring no other means of fastening such as tape, adhesive, etc. Comply with ANSI A13.1 for colors. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portions of lines. Marking of short branches and repetitive branches for equipment connections is not required.

B. Below Grade Piping: Bury a continuous, pre-printed, bright-colored, metallic ribbon marker capable of being located with a metal detector with each underground pipe. Locate directly over buried pipe, 6" to 8" below finished grade.

C. Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-4). Provide 1/2" high lettering - white on black background. Nameplates shall be permanently secured to the exterior of the unit.

D. Valves: Provide brass valve tags with brass hooks or chains on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops and shut-off valves at fixtures and other repetitive terminal units. Prepare and submit a tagged-valve schedule, listing each valve by tag number, location and piping service. Deliver to Owner through the Engineer.

1.28 CLEANING

A. Progressively and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work. This includes but is not limited to building surfaces, piping, equipment and ductwork, inside and out. Surfaces shall be free of dirt, grease, labels, tags, tape, rust, and all foreign material.

1.29 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Printed: Three copies of Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts list for all faucets, trim, valves, etc. shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. AC-3). All Wiring Diagrams shall agree with reviewed Shop Drawings and indicate the exact field installation. All instructions shall be submitted at the same time and shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. Pumps, Fans, Motors, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included.

B. Verbal: The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The controls contractor shall present that portion of the instructions that apply to the control system. The Engineer's office shall be notified 48 hours prior to this meeting.

C. Acknowledgment: The Contractor shall prepare a letter indicating that all operation and maintenance instructions (printed and verbal) have been given to the Owner, to the Owner's satisfaction. This letter shall be acknowledged (signed) by the Owner and submitted to the Engineer.

1.30 RECORD DRAWINGS

A. The Contractor shall obtain one set of prints for the project, upon which a record of all construction changes shall be made. As the work progresses, the Contractor shall maintain a record of all deviations in the work from that indicated on the drawings. Final location of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, i.e. building, curbs, walks. In addition, the water, gas, sewer, under floor duct, etc. within the building shall be recorded by offset distances from building walls. An electronic copy of the original drawings will be made available to the Contractor. The Contractor shall transfer the changes, notations, etc. from the marked-up prints to the electronic copy. The record drawings (marked-up prints, electronic drawings disc and a hard copy) shall be submitted to the Engineer for review.

1.31 ACCEPTANCE TESTING

A. The Contractor shall perform, document and submit all acceptance testing as required by California Code of Regulations, Title 24, Part 6.

END OF SECTION

SECTION 220050
PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Division.

1.2 GENERAL MECHANICAL PROVISIONS

A. The preceding General Mechanical Provisions shall form a part of this Division with the same force and effect as though repeated here.

1.3 SCOPE

A. Included: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:

1. Sanitary sewer system.
2. Domestic water system.
3. Storm drain system (including rainwater leaders).
4. Drain system (including condensate drain).
5. All equipment as shown or noted on the drawings or as specified.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Sanitary Sewer:

a. Soil, Waste and Vent Piping: Inside Building and Within Five Feet of Building Walls: Standard weight coated cast iron pipe and fittings, CISPI 301, or hub end with rubber gaskets, ASTM A74, ASTM C564. All cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute as manufactured by Tyler, AB&I or Charlotte. Heavy-duty shielded couplings, Type 304 stainless steel, with neoprene gasket, ASTM C1540. Husky HD 2000, Clamp-All 80. Mission HeavyWeight MG Couplings are also acceptable. Size 2" and smaller above grade

may be standard weight galvanized steel, ASTM A120/A53, with coated cast iron recessed drainage fittings, ANSI B16.12. 2" and smaller exposed to view shall be galvanized steel, ASTM A120/A53, with coated cast iron recessed drainage fittings, ANSI B16.12. Fixture and equipment drains exposed to view in kitchens shall be DWV copper, recessed drainage fittings, 95-5 solder.

1. Cleanouts: Comparable models of Josam, Wade or Zurn are acceptable. Floor Cleanouts: Smith 4028 with nickel bronze top in finished areas; Smith 4228 in utility areas. Wall Cleanouts: Smith 4532 with stainless steel cover and screw. Pipe Cleanouts: Iron body with threaded brass plug.

2. Cleanout Box: Precast reinforced concrete. Cast iron lid marked for service. Christy F22 in foot traffic areas; G5 in roadways.

B. Storm Drain (Including Rain Water Leader, RWL):

1. Piping: Inside Building and Within Five Feet of Building Walls: Same as Soil, Waste and Vent Piping, except as otherwise noted on drawings. Where exposed to view on exterior of building, piping shall be galvanized steel with recessed drainage fittings.

C. Water:

1. Cold Water Piping:

a. Inside Building, Within Five Feet of Building Walls, and All Above Grade:

1) Schedule 40 galvanized steel pipe, ASTM A120/A53. 150 psi galvanized malleable iron screwed fittings, ANSI B16.3.

-or-

2) Hard temper seamless copper, ASTM B88. Wrought copper fittings, ANSI B16.22. Type L with brazed joints (1100F, min.). 1-1/2" and smaller above grade may be soldered, 95-5 tin-antimony solder. All nipples shall be red brass (85% copper). Above grade fittings may be copper (1/2” to 2”) or bronze (2-1/2” to 4”) press fittings, ASME B16.18 or ASME B16.22. EPDM O-rings. Installation shall be in accordance with the manufacturer’s installation instructions. Nibco, ProPress.

b. Outside Building - Below Grade:

1) Same as Inside Building. Galvanized steel shall have protective coating.

-or-

2) 3" and Smaller: Schedule 40 Polyvinyl chloride (PVC) with solvent weld fittings where approved by administrative authority.

2. Hot Water Piping:

   a. Inside Building - Above Slab: Same as Cold Water Piping - Inside Building.

   b. Outside Building or Below slab: Pre-insulated. Type L copper core. 1" foamed polyurethane insulation. Polyvinyl chloride jacket. Sealed ends. Rubber ring internal slip joint. Fittings shall be wrought copper, with brazed joints (1100F, min.). Ricwil, Thermal Pipe Systems.

3. Valves and Specialties:

   a. Valves:

      1) General: Manufacturer's model numbers are listed to complete description. Equivalent models of Crane, Grinnell, Milwaukee, Nibco, Stockham or Walworth are acceptable. All valves of a particular type or for a particular service shall be by the same manufacturer. All valves in potable water piping shall be “lead free.” Butterfly valves may be substituted for 2-1/2" and larger gate valves above grade; see specification below. Use full port ball valve for 2” and smaller water shutoff valves; see specification below.

      2) Gate Valve: 2" and Smaller: All bronze. Rising stem. Union bonnet. Wedge disk. Malleable iron handwheel. 200 psi WOG. Stockham B-105. 2-1/2" and Larger: Iron body, bronze mounted. Non-rising stem. Wedge disk. 200 psi WOG. Flanged or AWWA hub end as applicable. Stockham G-612. Underground valves shall have square operating nut. Provide one operating "T" handle for underground valves.

      3) Butterfly Valve: Iron threaded lug body. Aluminum bronze disk. O-ring seals. Resilient, removable seat. 416 stainless steel shaft. 6" and smaller valves shall have multi-position lever handle. 8" and larger valves shall have gear operator. Provide 2" extension neck at insulated pipes. Demco Series NE, Grinnell, Stockham

      4) Check Valve: 2" and Smaller: All bronze swing check, regrinding. 200 psi WOG. Stockham B-319.

      5) Ball Valve: Full port. Bronze body, cap, stem, disk and ball. Screwed connection. Lever handle. TFE seat. O-ring seals. 300 psi WOG. Apollo, Grinnell, Jomar.

6) Valve Box: Precast reinforced concrete. Cast iron lid marked for service. Christy G5 in roadways (use B-9 for ball valves).

c. Miscellaneous Specialties:

1) Temperature and Pressure Relief Valve: ASME rated fully automatic, reseating combination temperature and pressure relief valve sized in accordance with energy input. Sensing element immersed within upper 6" of tank. Watts.

2) Union: 2" and Smaller: AAR malleable iron, bronze to iron ground seat. 300 psi. Grinnell. Size 2-1/2" and Larger: Grooved pipe, synthetic gasket, malleable iron housing. Victaulic Style 77, Type "E" gasket, Grinnell.

3) Dielectric Coupling: Insulating union or flange rated for 250 psig. EPCO.

4) Shock Absorber: Multiple bellows. Seamless copper chamber approved for concealed installations. Designed and applied in accordance with PDI WH201. Sioux Chief, Watts.

5) Flexible Connection: Corrugated bronze core covered with high tensile bronze tubular braid. 150 psi working pressure. 2" and smaller shall have screwed connections. 2-1/2" and larger shall have flanged connections. Flexonics, Keflex.

D. Drain Piping (including Condensate): Copper Type L as specified above for inside building cold water piping.

E. Miscellaneous Piping Items:

1. Pipe Support:

a. Pipe Hanger: Steel "J" hanger with side bolt for piping 4" and smaller; steel clevis hanger for piping 5" and larger. Load and jam nuts. Size and maximum load per manufacturer's recommendation. Felt liner for copper piping. Hanger and rod shall have galvanized finish. B-Line, Grinnell, Unistrut.

b. Isolating Shield: Galvanized steel shell and reinforcing ribs. 1/4" non-conducting hair felt pad. Pipe hanger in accordance with paragraph above. Increase hanger size per manufacturer's recommendation. B-Line, Semco, Superstrut.

c. Construction Channel: 12-gage, 1-5/8" x 1-5/8" galvanized steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Grinnell, Unistrut.

2. Flashing: Vent flashing shall be 4 lb/ft2 lead, 16" sq. flange, length sufficient to be turned down 2" into vent. Oatey. Flashing for other piping through roof shall be prefabricated galvanized steel roof jacks with 16" sq. flange. Provide clamp-on storm collar and seal water tight with mastic. For cold process built-up roof, material shall be 4 lb/ft^2 lead instead of galvanized steel.

2.2 PIPING INSULATION MATERIALS

A. General: All piping insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Pre-Molded Fiberglass: Heavy density sectional pre-molded fiberglass with vapor barrier laminated all service jacket and pressure sealing vapor barrier lap. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft2-F at a mean temperature of 50F. Perm rating 0.02, ASTM E96. Puncture rating 50 Beach units, ASTM D781. Provide 3" (min.) wide tape of same material as lap for butt joints. For hot water piping, thickness shall be 1" for pipe sizes 3/4" and less; 1-1/2" thickness for pipe sizes 1" and larger. Certainteed, Knauf, Johns-Manville, Owens-Corning.

C. Fiberglass Blanket: Unfaced. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft2-F at a mean temperature of 50F. 1-1/2" thickness. Knauf, Johns-Manville, Owens-Corning.

D. PVC Jacket (for pipe, fittings and valves): Pre-molded polyvinyl chloride (PVC) jackets, 0.020" thickness. Size to match application. Provide solvent weld adhesive and PVC vapor barrier pressure sealing tape by same manufacturer. Zeston.

E. Stretchable Glass Fabric: Reinforcing mesh. 10 X 20 continuous filament glass yarns per inch. Johns-Manville.

F. Vapor Barrier Coating: Childers CP-30, Foster 30-25.

G. Lagging Adhesive: Childers CP-50A, Foster 30-36.

H. Outdoor Mastic: Childers CP-21, Foster 65-05.

I. Insulating Tape: Ground virgin cork and synthetic elastomeric. Black, odorless, and non-toxic. K factor 0.43 Btu-in/hr-ft2-F or less. Non-shrinking. For outdoor use, provide protective finish by same manufacturer. Halstead.

J. Molded Closed Cell Vinyl (Piping Insulation Under Disabled Accessible Lavatories and Sinks): Fully molded closed cell vinyl, 3/16" thick. Internal ribs on drain

insulation to provide air gap. Thermal conductivity shall not exceed 1.17 BTU-in/hr-ft^2-°F at an average temperature of 73°F. Weep hole in cleanout nut enclosure. Out of sight nylon fastening system. Hinged cap over valve to allow access for servicing. Truebro Lav-guard.

2.3 FIXTURES

A. General: Provide rough-in for and install all plumbing fixtures shown on drawings. Except in equipment rooms, all trim, valves and piping not concealed in wall structure, above ceiling or below floors, shall be brass with polished chrome plate finish, unless noted otherwise. All enameled fixtures shall be acid resisting. Standard color is white unless otherwise noted.

B. Schedule: Refer to Plumbing Fixture Schedule on the drawings for list of fixtures and trim. Manufacturer's model numbers are listed to complete description. Equivalent models of American Standard, Eljer, Elkay, Haws, Kohler or T&S Brass are acceptable. For drainage fixtures, equivalent models of Josam, Smith or Zurn are acceptable.

C. Stops and P-Traps: All fixtures shall be provided with stops and P-Traps as applicable. Wall mounted faucets, valves, etc. shall have integral stops or wall mounted stops.

1. Stops: All hot and cold water supplies shall be 1/2" I.P.S. inlet angle stops with stuffing box, loose key lock shield, and brass riser (3/8" for 2-1/2 gpm and less, otherwise 1/2"). McGuire, Speedway.

2. P-Traps: Semi-cast brass, ground joint. 17-gage. Clean-out plug. Unobstructed waterway. California Tubular, McGuire.

2.4 EQUIPMENT

A. General Requirements:

1. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.

2. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.

3. Ratings:

a. Electrical: Electrical equipment shall be in accordance with NEMA

standards and UL or ETL listed where applicable standards have been established.

4. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.

5. Electrical:

a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories and controls required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.

b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.

c. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring. .

B. Water Heater: Electric. Glass lined tank with magnesium anode protection. 150 psi working pressure. Fully insulated. Automatic temperature control. High limit control. Provide ASME rated temperature and pressure relief valve sized in accordance with energy input, dielectric couplings and drain cock. UL listed. A.O. Smith, American Appliance, State Industries.

C. Circulating Pump: In-line centrifugal. Aluminum housing. All parts exposed to fluid, stainless steel. Water lubricated ceramic shaft and bearings. Epoxy encapsulated windings. Grundfos. -Or- Bronze body, brass impeller. Mechanical seals. Bronze sleeve bearings. Integral thermal overload protection. Bell and Gossett, Taco, Thrush.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General:

1. Piping Layout: Piping shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by the Engineer. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed in a manner to ensure unrestricted flow, eliminate air pockets, prevent any unusual noise, and permit complete drainage of the system. All piping shall be installed to permit expansion and contraction without strain on piping or equipment. Vertical lines shall be installed to allow for building settlement without damage to piping. Pipe sizes indicated on the drawings are nominal sizes unless otherwise noted. Provide secondary drain piping where required.

2. Joints:

    a. Threaded: Pipe shall be cut square and reamed to full size. Threads shall be in accordance with ANSI B2.1. Joint compound or tape suitable for conveyed fluid shall be applied to male thread only. Joints shall be made with three threads exposed.

    b. Welded or Brazed: Filler rod shall be of suitable or the same alloy as pipe. Brazing filler metal shall have a minimum melting point of 1100F. Welding or brazing shall be performed by a Certified Welder or Brazer as certified by an organization/institution that uses standards recognized by the American Welding Society (AWS) and meets the requirements of the ASME Boiler and Pressure Vessels Code, Section 9.

    c. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.

    d. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards.

3. Fittings and Valves:

    a. Standard Fittings: All joints and changes in direction shall be made with standard fittings. Close nipples shall not be used.
    b. Reducers: Pipe size reduction shall be made with bell reducer fittings. Bushings shall not be used.

    c. Unions: A union shall be installed on the leaving side of each valve, at all sides of automatic valves, at equipment connections, and elsewhere as necessary for assembly or disassembly of piping.

    d. Valves: All valves shall be full line size. Provide shut-off valve for each building and each equipment connection. Provide shut-off valve at each point of connection to existing piping. At equipment

connections, valves shall be full size of upstream piping, except that gas valves within 18" of the point of connection to the equipment may be the same size as the equipment connection.

e. Valve Accessibility: All valves shall be located so that they are easily accessible. Valves located above ceilings shall be installed within 24" of the ceiling. Refer to specification 200000 for access requirements.

4. Pipe Support:

a. General: Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Side beam clamps shall be provided with retaining straps to secure the clamp to the opposite side of the beam. Vertical piping shall be supported with riser clamp at 20' on center (maximum). Support pipe within 12" of all changes in direction. Support individual pipes with pipe hanger. Copper piping systems which protrude through a surface for connection to a fixture stop or other outlet shall be secured with a drop ell, Grinnell No. 9788; nipple through surface shall be threaded brass.

1) Pressure Pipe:

Pipe Size (Inches)	Maximum Spacing* Between Supports (ft.)		
	Copper	Sch. 40 steel	Plastic
1/2	6	6	4
3/4	6	8	4
1	6	8	4
1-1/4	6	10	4
1-1/2	6	10	4
2	10	10	4
2-1/2	10	10	4
3	10	10	4
4	10	10	4

*Based on straight lengths of pipe with couplings only. Provide additional supports for equipment, valves or other fittings. Plastic piping shall be supported per the manufacturer's recommendations. Seismic requirements may reduce maximum spacing.

2) Gravity Drain Pipe: Piping shall be supported at each length of pipe or fitting, but in no case at greater spacing than indicated above for pressure pipe.

b. Hot and Cold Water Piping: All hot and cold water piping shall have isolating shield; no portion of this piping shall touch the structure without an isolating shield except at anchor points for fixture rough-in.

c. Trapeze: Trapeze hangers of construction channel and pipe clamps may be used. Submit design to Engineer for review.

5. Miscellaneous:

a. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings, or floors in finished areas.

b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" annular clearance between sleeve and pipe for piping 3" and smaller, otherwise 2" annular clearance. Piping through walls below grade shall be sealed with Link-Seal.

c. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe or pipe insulation sealed with fire rated materials in accordance with the requirements of the fire authority having jurisdiction.

d. Dielectric Couplings: Dielectric couplings shall be installed wherever piping of dissimilar metals are joined, except that bronze valves may be installed in ferrous piping without dielectric couplings.

e. Thermometer or Pressure Gage Tap: Provide tee for instrument well. Minimum size of pipe surrounding well shall be 1-1/2".

f. Exposed Pipe at Fixtures: Piping extending from finished surfaces into a finished room shall be chrome plated brass, except under kitchen sinks in commercial kitchens.

B. Sanitary Sewer Piping:

1. General: Where inverts are not indicated, sanitary sewer piping shall be installed at 1/4" per foot pitch. Piping 4" and larger may be installed at 1/8" per foot pitch where structural or other limitations prevent installation at a greater pitch. Bell and spigot piping shall be installed with barrel on sand bed; excavate hole for bell.

2. Cleanouts: Install cleanouts at ends of lines, at changes of direction greater than 45 degrees, and at not greater than 100 foot intervals. Locate interior cleanouts in accessible locations and bring flush to finished surface.

3. Vents: Vents shall terminate not less than 6" above the roof nor less than

24" from any vertical surface nor within 10' of any outside air intake. Install horizontal vent lines at 1/4" per foot pitch. Offset vents 2' minimum from gutters, parapets, ridges and roof flashing.

C. Storm Drain (Including Rain Water Leader, RWL): Similar to Sanitary Sewer.

D. Water Piping: Connections to branches and risers shall be made from top of main. Supply header in fixture battery shall be full size to last fixture, reducing in size only on individual connections to each fixture in battery. Minimum pipe size shall be 3/4", unless otherwise noted. Exposed fixture stops and flush valves shall be installed with brass nipples for copper piping and galvanized nipples for galvanized piping. Nipples are to extend from outside of wall to fitting at header or drop behind finish wall surfaces. Pipe nipples shall be same size as stop or flush valve. Provide shut off for each building and each connection to equipment. Shock absorbers shall be installed in a vertical position per manufacturer’s instructions and per PDI-WH 201 where flush valves, metering faucets or other fast acting valves are connected to the domestic piping system. Only equipment mounted on vibration isolators shall be connected with flexible connections. Underground hot water and cold water piping which run parallel to each other shall be installed a minimum of 3 feet apart.

E. Drain Piping (Including Condensate): Install with constant pitch to receptacle, 1/4" per foot where possible, otherwise 1/8" per foot minimum. Provide TEE with clean-out plug at all changes of direction. Provide trap at each air handling unit to prevent air leakage. Only equipment mounted on vibration isolators shall be connected with flexible connection. Piping not concealed in wall structure, above ceilings or below floors shall be chrome plated brass.

F. PVC Piping: Shall be cut square and assembled prior to solvent weld. Apply primer per manufacturer's recommendations. Coat male joint fully with solvent, make joint before solvent dries and wipe exterior clean.

3.2 PIPING INSULATION INSTALLATION:

A. Domestic Hot Water:

1. General: All domestic hot water piping, fittings and accessories shall be insulated.

2. Pipe: Apply pre-molded fiberglass sections to pipe using integral pressure sealing lap adhesive in accordance with manufacturer's recommendations. Stagger longitudinal joints. Seal butt joints with factory supplied pressure sealing tape.

3. Fittings and Valves:

a. Wrap all fittings and valves with pre-cut fiberglass blanket to thickness matching adjoining insulation. Cover blanket with PVC jacket in accordance with manufacturer's recommendations.

Solvent weld. Seal all joints with factory supplied pressure sealing vapor barrier tape with 1-1/2" (min.) overlap on both sides of joint. Insulate valves to stem. Do not insulate unions, flanges or valves unless water temperature exceeds 140ºF or the piping is exposed to weather.

b. For miscellaneous fittings and accessories for which PVC jackets are not available or where proximity of fittings precludes a neat-appearing installation, the Contractor may cover the fiberglass blanket with stretchable glass fabric, one coat of lagging adhesive and a final coat of vapor barrier coating. All exposed ends of insulation shall be adequately sealed.

4. Additional Finish for Exposed Piping and Equipment: All piping and equipment exposed to view but protected from the weather shall be given an additional finish of PVC jackets.

B. Cold Water Piping-Freeze Protection: All cold water piping exposed to weather shall be wrapped with insulating tape, 50% overlap. Cover valves to stem. Apply at least two coats of protective finish.

C. Piping Insulation Under Disabled Accessible Lavatories and Sinks: Hot and cold water piping, hot and cold water stop and drain piping under disabled accessible lavatories and sinks shall be insulated with 3/16" thick molded closed cell vinyl to prevent accidental injury due to contact or temperature extremes. Installation shall be in accordance with manufacturer's instructions. There shall be no sharp or abrasive surfaces under disabled accessible lavatories and sinks.

3.3 FIXTURE INSTALLATION

A. Fixture Height: Shall be as indicated on Architectural drawings.

B. Floor Drains or Floor Sinks: Shall be placed parallel to room surfaces, set level, flush with floor, and adjusted to proper height to drain. Cover openings during construction to keep all foreign matter out of drain line.

C. Wall Hung Fixtures: Shall be provided with proper backing and hanger plates secured to wall. Lavatories shall be supported with concealed arm supports. Fixtures mounted on carriers shall bear against stop nuts, clear of wall surface. Caulk fixtures against walls with white G.E. "Sanitary 1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).

D. Floor Mounted Fixtures: Shall be provided with proper support plates. Grout at the floor with waterproof ceramic tile grout.

E. Other Connections: Rough-in and connection for trim or fixtures supplied by others shall be included in this specification section.

3.4 EQUIPMENT INSTALLATION

A. General: It shall be the responsibility of the equipment installer to insure that no work done under other specification sections shall in any way block, or otherwise hinder the equipment. All equipment shall be securely anchored in place.

B. Connections to Equipment: Where size changes are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

3.5 TESTS AND ADJUSTMENTS

A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Engineer. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested. Tests may be made in sections, however, all connections between sections previously tested and new section shall be included in the new test.

B. Gravity Systems:

1. Sanitary Sewer: All ends of the sanitary sewer system shall be capped and lines filled with water to the top of the highest vent, 10' above grade minimum. This test shall be made before any fixtures are installed. Test shall be maintained until all joints have been inspected, but no less than 2 hours.

2. Storm Drain (Including Rainwater leader): Similar to Sanitary Sewer.

3. Drains (Including Condensate): Similar to Sanitary Sewer.

C. Pressure Systems:

1. General: There shall be no drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be isolated from system before test is made.

2. Domestic Hot and Cold Water Piping: Maintain 100 psig water pressure for 4 hours.

3.6 DISINFECTION

A. Disinfect all domestic water piping systems in accordance with AWWA Standard C651, "AWWA Standard for Disinfecting Water Mains", and in accordance with administrative authority. Disinfection process shall be performed in cooperation

with health department having jurisdiction and witnessed by a representative of the Engineer. During procedure signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, water samples shall be collected for bacteriological analysis. Certificate of Bacteriological Purity shall be obtained and delivered to the Owner through the Engineer.

END OF SECTION

SECTION 230100
GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section covers and applies to all work included in Divisions 22 through 23.

B. Work in this Section includes providing labor, materials, equipment, services necessary, fabrication, installation and testing for fully operational and safe systems including all necessary materials, appurtenances and features whether specified or shown in the contract documents or not, in conformity with all applicable codes and authorities having jurisdiction for the following:

1. Mechanical work covered by all sections within Divisions 22, 23 of the specifications, including, but not limited to:

a. Heating, ventilating and air conditioning systems and equipment.

b. Plumbing systems and equipment.

c. Fire protection systems and equipment

d. Control systems.

e. Testing and balancing.

C. Provide cutting and patching, for the Mechanical Work.

D. Provide piping from plumbing terminations, 10 feet from equipment, for water, gas, sanitary sewer and waste.

E. Provide drain piping for all equipment requiring drainage to floor drains, roof, sink, or funnel drains.

1.3 RELATED WORK AND REQUIREMENTS

A. Carefully check the documents of each section with those of other sections and Divisions. Ascertain the requirements of any interfacing materials or equipment being furnished and/or installed by those sections and Divisions, and provide the proper installation and/or required interface.

1.4 QUALITY ASSURANCE

A. Supply all equipment and accessories in compliance with the applicable standards listed in article 1.6 of this section and with all applicable national, state and local codes.

B. All items of a given type shall be the products of the same manufacturer, unless otherwise specified herein.

1.5 SUBMITTALS

A. Submit shop drawings, product data, samples and certificates of compliance required by Division 01.

B. Product Data Submittals: Submit manufacturers standard published data. Mark each copy to identify applicable products, models, options, accessories and other data. Supplement manufacturers standard data to provide information specific to this project.

C. Organize submittals in sequence according to Specification Section. Submit in single electronic PDF document with tabs identifying each Specification Section. Provide Table of Contents identifying the Specification Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package by Division at one time. Do not submit individual Sections piecemeal.

D. In addition to the submittal requirements of Divisions 22, 23, submit product data for the following items per the provisions Division 01:

1. All Equipment and Fixtures indicated in Schedules on Drawings.

2. Access panels

E. If more than two submissions are required (initial submittal and one resubmittal) based on rejection or lack of compliance by submittal, then the Contractor shall:

1. Arrange for additional reviews by the Design Engineers.

2. Pay all costs for such additional reviews.

F. Corrections or comments made on the shop drawings during review do not relieve the Contractor from compliance with requirements of the drawings and specifications. Shop drawing checking by the Engineer is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for:

1. Confirming and correlating all quantities and dimensions.

2. Selecting fabrication processes and techniques of construction.

3. Coordinating his work with that of all other trades.

4. Performing his work in a safe and satisfactory manner.

G. Substitutions:

1. Prior to Bid shall be in accordance with Division 01.

2. After award of contract, submit separate substitution request for each substitution in accordance with the requirements hereinbelow. Support each request with:

a. Complete data substantiating compliance of proposed substitution with requirements stated in Contract documents.

b. Data relating to changes in construction schedule.

c. Any effect of substitution on other Work in this and other Divisions, and any other related contracts, and changes required in other work or products.

3. Contractor shall be responsible at no extra cost to Owner for any changes resulting from proposed substitutions which affect work of other Sections or Divisions, or related contracts.

4. Claims for additional costs caused by substitution that may subsequently become apparent shall be met by the Contractor.

5. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.

6. Substitutions will not be considered for acceptance when acceptance will require revision of Contract Documents, unless Contractor bears cost of redesign.

a. Arrange for required redesign by Engineer.

b. Pay all costs for such redesign.

c. All subject to Architect's approval.

7. Approval of substitutions shall not relieve Contractor from full compliance with requirements of Contract documents.

H. As-built (Record) Drawings:

1. Shall be in accordance with Division 01.

2. Provide after installation is complete. Final signoff and Client acceptance will not occur prior to submission of As-built drawings to Architect/Engineer.

3. Indicate as-built conditions and all revisions, fully illustrating all revisions made by all trades in the course of work.

4. Dimension physical locations of ductwork, and piping with reference elevations and distances above finished floors, below beams, from wall faces, underground (invert elevations) and from column lines.

5. Exact location, type and function of concealed valves, dampers, controllers, piping, air vents, piping drains and isolators.

6. Indicate all equipment sizes and capacities and tag numbers.

7. Provide drawing on reproducible bond.

8. These drawings shall be for as-built record purposes for the Owner’s use and are not considered shop drawings.

I. Operating Instructions, Maintenance Manuals and Parts Lists:

1. Before requesting acceptance of work, submit one set for review by Architect/Engineer.

2. After review, furnish two (2) printed and bound sets.

3. Include:

a. Installers name, address, telephone number and representatives name, and website address.

b. Manufacturer's name, model number, service manual, spare-parts list, and descriptive literature for all components, cross referenced and numbered on Record Drawings, and in accordance with Title 24 as required.

c. Maintenance instructions.

d. Listing of possible breakdown and repairs.

e. Instruction for starting, operation and programming.

f. Detailed and simplified one line, color coded flow and wiring diagram.

g. Field test report, including:

1) Instrument set points.

2) Normal operating values.

h. Name, address and phone number of contractors equipment suppliers and service agencies.

i. Assemble manufacturer's equipment manuals in chronological order, following the specification alpha-numeric system, in heavy duty 3-ring binders clearly titled on the spine and front cover with appropriate index dividers.

J. Special Tools:

1. One set of any special tools required to operate, adjust, dismantle or repair equipment furnished under any section of this Division.

2. "Special tools": those not normally found in possession of mechanics or maintenance personnel.

3. Tag each item and cross reference in Maintenance Manual.

4. Turn over to Owner's representative or temporarily secure to unit at Architect's instruction.

K. Quantity of Submittals Required:

1. Product Data (brochures):

a. Submit electronic PDF copy of product data.

b. If comments are required, comment sheet(s) will be returned with submittal.

2. Samples:

a. Submit as required in each specification section.

1.6 REFERENCE STANDARDS

A. Reference standards of industry organizations, manufacturer associates and professional associations that publish standards of construction and/or materials that are referenced in this Division are listed in Division 01. The Standards as referenced in this Specification shall be considered as attached and binding to the requirements of the Construction Documents. The Contractor is to be considered as knowledgeable of these Standards and their requirements for the performance of the Work.

1.7 CODE COMPLIANCE

A. In addition to complying with all other legal requirements, comply with current provisions of governing codes and regulations in effect during progress of the Work, and with the following:

1. Drawings and specification requirements shall govern where they exceed Code and Regulation requirements.

2. Where requirements between governing Codes and Regulations vary, the more restrictive provisions shall apply.

3. Nothing contained in Contract Documents shall be construed as authority or permission to disregard or violate legal requirements. The Contractor shall immediately draw the attention of the Architect to any such conflicts noted in the Contract Documents.

1.8 DESCRIPTION OF BID DOCUMENTS

A. General:

1. Words or phrases such as "The Contractor shall," "shall be," "furnish," provide," “connect,” "a," "an," "the," and "all" etc. may be omitted for brevity.

2. The Drawings and Specifications are complimentary each to the other. Where discrepancies occur between the Drawings and Specifications, the more stringent provisions shall apply.

3. Examine all drawings and specifications prior to bidding the work. Report any discrepancies to the Engineer.

B. Specifications:

1. Specifications, in general, describe quality and character of materials and equipment and the Standards that govern. Contractor is responsible for design and construction costs incurred for equipment and materials other than the Basis of Design, including but not limited to architectural, structural, electrical, HVAC, fire sprinkler and plumbing.

2. Specifications are of simplified form and include incomplete sentences.

C. Drawings:

1. Drawings in general are diagrammatic and indicate scope, sizes, routing, locations, connections to equipment and methods of installation, but not necessarily offsets, obstructions or structural conditions. Drawings are not intended to show every item, fitting, transition or offset in its exact dimension or detail of equipment or proposed system layout. Locations on

drawings may be distorted for purposes of clearness and legibility.

2. Contractor to provide additional offsets, fittings, hangers, supports, valves, drains as required for construction and coordination with work of other trades.

3. Before proceeding with work, ordering or fabricating materials, check and verify all dimensions and carefully check space requirements with other Work to ensure that all equipment and materials can be installed in spaces allotted.

4. Contractor to assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.

5. The Contractor is responsible for installing the work in such a manner that it will conform to the structure and architectural elements, avoid obstructions, maintain headroom, leave adequate clearance for proper maintenance and repairs, and provide clearances and access required by codes. Do not scale distances off of mechanical drawings. Use actual field measured building dimensions.

6. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.

7. Above items to be performed at no additional cost to the Owner.

D. Typical details, where shown on the drawings, apply to each and every item of the project where such items are applicable. Typical details are not repeated in full on the plans, and are diagrammatic only, but with the intention that such details shall be incorporated in full.

1.9 DEFINITIONS

A. "Piping": pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.

B. "Motor Controllers": manual or magnetic starters (with or without switches), individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of motors.

C. "Control" or "Actuating Devices": automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.

1.10 JOB CONDITIONS

A. Adjoining work of other Divisions shall be examined for interferences and conditions affecting this Division.

B. Examine site related work and surfaces before starting work of any Section.

1. Report to Architect, in writing, conditions which will prevent proper provision of this work.

2. Beginning work of any Section without reporting unsuitable conditions to Architect constitutes acceptance of conditions by Contractor.

3. Perform any required removal, repair or replacement of this work caused by unsuitable conditions at no additional cost to Owner.

C. Connections to existing work.

1. Unknown conditions will be addressed if reasonable.

2. Contractor shall field verify existing dimensions prior to ordering or fabricating materials.

3. Install new work and connect to existing work with minimum interference to existing facilities.

4. Temporary shutdowns of existing services:

a. At no additional charges.

b. At times not to interfere with normal operation of existing facilities.

c. Provide 48 hour notification.

5. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work.

6. Restore existing disturbed work to original condition.

D. Removal and relocation of existing work.

1. Disconnect, remove or relocate material, equipment, plumbing fixtures, piping and other work noted and required by removal or changes in existing construction.

2. Where existing pipes, conduits and/or ducts which are to remain prevent installation of new work as indicated, relocate, or arrange for relocation, of existing pipes, conduits and/or ducts.

3. Provide new material and equipment required for relocated equipment.

4. Plug or cap active piping or ductwork behind or below finish.

5. Do not leave long dead-end branches. Cap or plug as close as possible to active line.

6. Remove unused piping, ductwork and material.

7. Dispose of removed fixtures and equipment as directed.

8. Turn over removed fixtures and equipment to Owner as directed.

E. Special Traffic Requirements:

1. Maintain emergency and service entrances useable to pedestrian, truck, and ambulance traffic at all times.

2. Where trenches are cut, provide adequate bridging for above-mentioned traffic.

1.11 TEMPORARY FACILITIES

A. See Division 01 for temporary facilities required.

1.12 SCHEDULE OF WORK

A. Arrange work to conform to schedule of construction established or required to comply with Contract Documents.

B. In scheduling, anticipate means of installing equipment through available openings in structure.

C. Confirm in writing to Architect, within 30 days of signing of contract, anticipated number of days required to perform test, balance, and acceptance testing of mechanical systems:

1. This phase must occur after completion of mechanical systems, including all control calibration and adjustment, and requires substantial completion of the building, including closure, ceilings, lighting, partitioning, etc.

2. Submit for approval at this time, names and qualifications of test and balancing agencies to be used.

1.13 NOISE REDUCTION

A. Cooperate in reducing objectionable noise or vibration caused by mechanical systems.

1. To extent of adjustments to specified and installed equipment and appurtenances.

B. Correct noise problems caused by failure to install work in accordance with Contract Documents. Include labor and materials required as result of such failure.

PART 2 - PRODUCTS

2.1 ACCESS DOORS

A. Size for proper access, adjusting and maintenance:

1. 12 in. x 12 in. minimum for valves, trap primers, shock absorbers, etc.

2. 24 in. x 24 in. for man access to concealed fans, coils, etc., unless indicated otherwise.

B. Provide as required by work in this Division.

C. Style, Color and Finish to match adjacent construction and as approved by Architect.

PART 3 - EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site through the construction of the project.

3.2 CUTTING AND PATCHING

A. All carpentry, cutting and patching to be done under trades doing that work. Work shall be done in accordance with Division 01.

B. Provide all carpentry, cutting and patching required for proper installation of material and equipment specified in Divisions 21, 22, 23 and 25.

C. Do not cut, notch or drill structural members without consent of Architect.

D. All cutting and repairing shall conform to Title 21 of California Administrative Code.

3.3 CONCRETE ANCHORS

A. Steel bolt with expansion anchor requiring a drilled hole – powder driven anchors are not acceptable.

B. Minimum concrete embedment shall be 4-1/2 diameters unless otherwise noted on plans.

C. Minimum spacing shall be 12 diameters center to center and 6 diameters center to edge of concrete unless otherwise noted on plans.

D. Maximum allowable stresses for tension and shear shall be 80% of the ICC test report values. Hilti, Phillips, Wej-It.

3.4 EQUIPMENT ANCHORING

A. All equipment shall be securely anchored in accordance with CBC.

B. All equipment mounted on concrete shall be secured with a concrete anchor as specified above at each mounting point.

C. Secure base plate as indicated above.

3.5 SUPPORTS AND SEISMIC RESTRAINTS

A. All mechanical systems (all ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance with Seismic Hazard Level 'A' of the "Guidelines for Seismic Restraint Manual: Guidelines for Mechanical Systems", current issue, as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), Chantilly, Virginia and in accordance with CBC.

3.6 WATER PROOFING

A. Under General Construction Work.

B. Where any work pierces waterproofing, installation shall be subject to review.

1. Provide all necessary sleeves, caulking, flashing and flashing fittings required to make openings absolutely watertight.

C. Flashing:

1. Mechanical Contractor shall provide flashing for all work in this Division, unless otherwise provided by roofing installer, as required to accommodate roof slope, roofing material, and roof installation method. No additional costs will be paid for lack of familiarity of Contractor with roofing type or slope.

2. Mechanical Contractor shall be responsible for coordinating size of penetrations and locations with roofing contractor.

3. Mechanical Contractor shall be responsible for scheduling installation of piping and other penetrations through roof structural system to exterior that they are complete and secure for the orderly installation of the roofing system.

4. 4 lb. lead.

5. 16 oz. lead coated copper.

6. No.22 USSG aluminum.

7. Fittings for piping through roof:

   a. Galvanized cast iron bottom recess roof type.

   b. Similar to Josam No. 26440 or No. 26450.

D. Provide weather protection canopies, hoods or enclosures over out-of-door equipment which could be damaged by exposure to weather.

1. This requirement applies to:

   a. Motors and drives.

   b. Controls.

   c. Instruments.

2. Identify items under such covers if entirely enclosed.

3.7 ACCESS TO VALVES AND EQUIPMENT

A. Access shall be possible where valves, expansion joints, fire dampers, motors, filters, control devices, and any other equipment requiring access for servicing, repairs, or maintenance are located in walls, soffits, chases, and/or above ceilings.

B. Definition of Accessible:

1. Valves and dampers may be operated.

2. Control devices may be adjusted.

3. Fire dampers may be reset.

4. Equipment access panels may be opened.

5. Normal maintenance work such as replacement of filters, lubrication of bearings, etc., may be performed readily within arm's reach of access

opening.

6. It shall not be necessary to crawl through furred ceiling space to perform such operations.

C. Install piping, equipment and accessories to permit easy access for maintenance.

D. Group concealed valves, expansion joints, controls, dampers and equipment requiring service access, so as to be freely accessible through access doors and to minimize the number of access doors required.

E. Relocate piping equipment and accessories as required, at no extra cost to afford proper maintenance access.

F. Coordinate location of access panels with applicable trades installing walls or ceiling.

1. Coordinate panel locations with lights and other architectural features.

2. Submit proposed panel locations to Architect for review.

G. Arrange for location and marking of removable tiles in splined ceilings where access panels are not installed.

H. Existing Structures:

1. When installation requires access openings through existing construction, coordinate location of necessary access panels, and arrange for respective trades to provide openings and framing which may be required.

2. Restore adjoining existing surfaces to original condition after new access panels have been installed.

3.8 CLEANING AND ADJUSTING

A. Work to be painted: Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.

B. Painted or exposed work soiled or damaged: Clean, repair and paint to match adjoining work before final acceptance.

C. Remove debris from inside and outside of materials and equipment.

D. Flush out piping after installation.

E. Adjust valves and automatic control devices.

F. Traps, wastes and supplies: unobstructed.

3.9 FIELD QUALITY CONTROL

A. Refer to Division 01.

B. Tests:

1. Perform as specified in individual Divisions, and as required by authorities having jurisdiction.

C. Furnish written report and certification that tests have been satisfactorily completed.

D. Repair or replace defective work, as directed.

E. Pay for restoring or replacing damaged work due to tests, as directed.

F. Pay for restoring or replacing damaged work of others, due to tests, as directed.

3.10 TRAINING

A. Provide training by qualified manufacturers' representatives for equipment as specified in this Division.

B. Training to include:

1. Site-specific training.

2. Minimum hours as specified in each Section.

3. Training materials (minimum six sets).

4. Electronic media available from the manufacturer [two (2) copies].

C. Each training session to be scheduled with Owner at least 30 days in advance.

END OF SECTION

SECTION 230500
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Grout.
6. Equipment installation requirements common to equipment sections.
7. Painting and finishing.
8. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Mechanical sleeve seals.
3. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Carbon steel or Stainless steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. PVC Pipe: ASTM D 1785, Schedule 40.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated

E. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

1. Finish: Polished chrome-plated

2.7 ACCESS DOORS

A. Size for proper access, adjusting and maintenance:
1. 12 in. x 12 in. minimum for valves, volume dampers, etc.
2. 24 in. x 24 in. for man access to concealed fans, coils, fire/smoke dampers, etc., unless indicated otherwise.

B. Provide as required by work in Division 21, 22, 23, and 25.

C. Style, color, and finish to match adjacent construction and as approved by Architect.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type with spring clips.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: [One-piece] [Split-casting] [One-piece or split-casting], cast-brass type with polished chrome-plated finish.

f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with [polished chrome-plated] [rough-brass] finish.
g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. PVC or Steel Pipe Sleeves: For pipes smaller than NPS 6.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 ACCESS TO VALVE AND EQUIPMENT

A. Access shall be possible where valves, expansion joints, fire dampers, motors, filters, control devices, and any other equipment requiring access for servicing, repairs, or maintenance are located in walls, soffits, chases, and/or above ceilings.

B. Definition accessible:

1. Valves and dampers may be operated.
2. Controls devices may be adjusted.
3. Fire damper may be reset.
4. Equipment access panels may be opened.
5. Normal maintenance work such as replacement of filters, lubrication of bearings, etc., may be performed readily within arm's reach of access opening.
6. It shall not be necessary to crawl through furred ceiling space to perform

C. Install piping, equipment and accessories to permit easy for maintenance.

D. Group concealed valves, expansion joints, controls, dampers and equipment requiring service access, so as to be freely accessible through access doors and to minimize the number of access doors required

E. Relocate piping equipment and accessories as required, at no extra cost to afford proper maintenance access.

F. Coordinate location of access panels with applicable trades installing walls or ceiling.

1. Coordinate panel locations with lights and other architectural features.
2. Submit proposed panel locations to Architect for review.

G. Arrange for location and marking of removable tiles in splined ceilings where access panels are not installed.

3.6 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

D. Cure placed grout.

END OF SECTION

SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

B. Related Sections:
1. Division 23 Section(s) ["Metal Ducts"][and]["Nonmetal Ducts"] for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7-16.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

2. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Flex-Strut Inc.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation; Tyco International, Ltd.
    g. Wesanco, Inc.
    h. <Insert manufacturer's name>.

3. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
4. Standard: MFMA-4.
5. Channels: Continuous slotted steel channel with inturned lips.
6. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of [carbon steel] [stainless steel] <Insert material>.
8. Metallic Coating: [Electroplated zinc] [Hot-dipped galvanized] [Mill galvanized] [In-line, hot galvanized] [Mechanically-deposited zinc].
9. Paint Coating: [Vinyl] [Vinyl alkyd] [Epoxy] [Polyester] [Acrylic] [Amine] [Alkyd] <Insert paint type>.
10. Plastic Coating: [PVC] [Polyurethane] [Epoxy] [Polyester] <Insert plastic type>.
11. Combination Coating: <Insert coating materials in order of application>.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

    a. Anvil International; a subsidiary of Mueller Water Products Inc.
    b. Empire Industries, Inc.
    c. ERICO International Corporation.
    d. Haydon Corporation; H-Strut Division.
    e. NIBCO INC.
    f. PHD Manufacturing, Inc.
    g. PHS Industries, Inc.
    h. <Insert manufacturer's name>.

3. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
4. Standard: Comply with MFMA-4.
5. Channels: Continuous slotted steel channel with inturned lips.

6. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
7. Hanger Rods: Continuous-thread rod, nuts, and washer made of [carbon steel] [stainless steel] <Insert material>.
8. Coating: [Zinc] [Paint] [PVC] <Insert coating>.

2.4 THERMAL-HANGER SHIELD INSERTS

A. 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:

B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, [zinc-coated] [stainless-] steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer.

Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 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 a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 [painting Sections.] [Section "High-Performance Coatings."]

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F,pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use [powder-actuated fasteners] [or] [mechanical-expansion anchors] instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch (0.8-mm) or anodized aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/2 inch (13 mm). Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/2 inch (13 mm). Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Red.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
   1. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Painting."

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 20 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
   7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Refrigerant Piping:

    a. Background Color: [Yellow.
    b. Letter Color: Black.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.
b. Variable-air-volume systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

A. Qualification Data: Within 45 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Certified TAB reports.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB with a minimum of 10 years of successful testing, adjusting, and balancing experience.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine operating safety interlocks and controls on HVAC equipment.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB’s “Procedural Standards for TAB,” and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

    a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.8 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

    a. Rooms with Multiple Supply Outlets: 0% to plus 10% of air flow rate in CFM for whole room indicated on drawings.

3.9 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing.

Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.10 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.

e. Fan drive settings including settings and percentage of maximum pitch diameter.
f. Inlet vane settings for variable-air-volume systems.
g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F (deg C).
d. Duct static pressure in inches wg (Pa).
e. Duct size in inches (mm).
f. Duct area in sq. ft. (sq. m).
g. Indicated air flow rate in cfm (L/s).
h. Indicated velocity in fpm (m/s).
i. Actual air flow rate in cfm (L/s).
j. Actual average velocity in fpm (m/s).
k. Barometric pressure in psig (Pa).

F. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.11 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:

    a. Measure airflow of at least 10 percent of air outlets.
    b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
    c. Verify that balancing devices are marked with final balance position.
    d. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
3. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
4. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 230700
HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:
   a. Flexible elastomeric.
   b. Mineral fiber.
2. Adhesives.
3. Mastics.
4. Lagging adhesives.
5. Sealants.
6. Factory-applied jackets.
7. Field-applied fabric-reinforcing mesh.
8. Field-applied cloths.
9. Field-applied jackets.
10. Tapes.
11. Securements.

B. Related Sections:
1. Division 22 Section "Plumbing Insulation."
2. Division 23 Section "Metal Ducts" for duct liners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

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. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSP jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

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. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Adhesive: Comply with MIL-A-24179A, Type II, Class I.

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. Aeroflex USA Inc.; Aeroseal.
b. Armacell LCC; 520 Adhesive.
c. Foster Products Corporation, H. B. Fuller Company; 85-75.
d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

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. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. PVC Jacket Adhesive: Compatible with PVC jacket.

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 Chemical Company (The); 739, Dow Silicone.

b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Speedline Vinyl Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of <Insert value> g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

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. Childers Products, Division of ITW; CP-35.
b. Foster Products Corporation, H. B. Fuller Company; 30-90.
c. ITW TACC, Division of Illinois Tool Works; CB-50.
d. Marathon Industries, Inc.; 590.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of <Insert value> g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following]:

a. Childers Products, Division of ITW; CP-52.
b. Foster Products Corporation, H. B. Fuller Company; 81-42.
c. Marathon Industries, Inc.; 130.
d. Mon-Eco Industries, Inc.; 11-30.

e. Vimasco Corporation; 136.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
4. Service Temperature Range: Minus 50 to plus 180 deg F.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. FSK and Metal Jacket Flashing Sealants:

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. Childers Products, Division of ITW; CP-76-8.
b. Foster Products Corporation, H. B. Fuller Company; 95-44.
c. Marathon Industries, Inc.; 405.
d. Mon-Eco Industries, Inc.; 44-05.
e. Vimasco Corporation; 750.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.

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. Vimasco Corporation; Elastafab 894.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

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. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto PVC Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

C. Metal Jacket:

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. Childers Products, Division of ITW; Metal Jacketing Systems.
    b. PABCO Metals Corporation; Surefit.
    c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing or Factory cut and rolled to size.
    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.

d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

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. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

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. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
b. Compac Corp.; 130.
c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
d. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

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. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    b. Compac Corp.; 120.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
    d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

A. Bands:

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. Childers Products; Bands.
    b. PABCO Metals Corporation; Bands.
    c. RPR Products, Inc.; Bands.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316; 0.015 inch thick, 1/2 inch wide with wing or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy or 0.062-inch soft-annealed, stainless steel or 0.062-inch soft-annealed, galvanized steel.

1. 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:

    a. C & F Wire.
    b. Childers Products.
    c. PABCO Metals Corporation.
    d. RPR Products, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping"irestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply, return and outdoor air.
2. Outdoor, concealed supply and return.
3. Outdoor, exposed supply and return.

B. Items Not Insulated:
1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.

2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

B. Concealed, round and flat-oval, return-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

C. Concealed, round and flat-oval, outdoor-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

D. Concealed, round and flat-oval, exhaust-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

E. Concealed, rectangular, supply-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

F. Concealed, rectangular, return-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

G. Concealed, rectangular, outdoor-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

H. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

I. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated [blanket] [board] [blanket or board]; thickness as required to achieve 2-hour fire rating.

J. Concealed, supply-air plenum insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

K. Concealed, return-air plenum insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.

5. Polyolefin: [1 inch] <Insert thickness> thick.

L. Concealed, outdoor-air plenum insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.

M. Concealed, exhaust-air plenum insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.

N. Exposed, round and flat-oval, supply-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

O. Exposed, round and flat-oval, return-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

P. Exposed, round and flat-oval, outdoor-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

Q. Exposed, round and flat-oval, exhaust-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.

2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

R. Exposed, rectangular, supply-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

S. Exposed, rectangular, return-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

T. Exposed, rectangular, outdoor-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

U. Exposed, rectangular, exhaust-air duct insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

V. Exposed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated [blanket] [board] [blanket or board]; thickness as required to achieve 2-hour fire rating.

W. Exposed, supply-air plenum insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

X. Exposed, return-air plenum insulation shall be[one of] the following:

1. Flexible Elastomeric: [1 inch] <Insert thickness> thick.
2. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
3. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
4. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.
5. Polyolefin: [1 inch] <Insert thickness> thick.

Y. Exposed, outdoor-air plenum insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.

Z. Exposed, exhaust-air plenum insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [1-1/2 inches] [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1 inch] [1-1/2 inches] [2 inches] <Insert thickness> thick.

3.11 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Concealed, round and flat-oval, supply-air duct insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

C. Concealed, round and flat-oval, return-air duct insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

D. Concealed, round and flat-oval, outdoor-air duct insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

E. Concealed, rectangular, supply-air duct insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

F. Concealed, rectangular, return-air duct insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

G. Concealed, supply-air plenum insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

H. Concealed, return-air plenum insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

I. Exposed, round and flat-oval, supply-air duct insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

J. Exposed, round and flat-oval, return-air duct insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

K. Exposed, rectangular, supply-air duct insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

L. Exposed, rectangular, return-air duct insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

M. Exposed, supply-air plenum insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

N. Exposed, return-air plenum insulation shall be[one of] the following:

1. Mineral-Fiber Blanket: [2 inches] [3 inches] <Insert thickness> and [0.75-lb/cu. ft.] [1.5-lb/cu. ft.] [3-lb/cu. ft.] nominal density.
2. Mineral-Fiber Board: [2 inches] [3 inches] <Insert thickness> thick and [2-lb/cu. ft.] [3-lb/cu. ft.] [6-lb/cu. ft.] nominal density.
3. Phenolic: [1-1/2 inches] [2 inches] <Insert thickness> thick.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Flexible Elastomeric: 1/2 inch thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Flexible Elastomeric: 1 inch thick.

C. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be one of the following:

   a. Flexible Elastomeric: 1 inch thick.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be[one of] the following:

   a. Cellular Glass: [2 inches] <Insert thickness> thick.
   b. Flexible Elastomeric: [2 inches] <Insert thickness> thick.
   c. Mineral-Fiber, Preformed Pipe Insulation, Type I: [2 inches] <Insert thickness> thick.
   d. Phenolic: [2 inches] <Insert thickness> thick.
   e. Polyisocyanurate: [2 inches] <Insert thickness> thick.
   f. Polyolefin: [2 inches] <Insert thickness> thick.
   g. Polystyrene: [2 inches] <Insert thickness> thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing:

1. All Pipe Sizes: Insulation shall be[one of] the following:

   a. Flexible Elastomeric: [2 inches] <Insert thickness> thick.

b. Polyolefin: [2 inches] <Insert thickness> thick.

3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.
2. [PVC] [PVC, Color-Coded by System]: [20 mils] [30 mils] thick.
3. Aluminum, [Smooth] [Corrugated] [Stucco Embossed]: [0.016 inch] [0.020 inch] [0.024 inch] [0.032 inch] [0.040 inch] thick.
4. Painted Aluminum, [Smooth] [Corrugated] [Stucco Embossed]: [0.016 inch] [0.020 inch] [0.024 inch] [0.032 inch] thick.
5. Stainless Steel, Type [304] [316] [304 or 316], [Smooth 2B Finish] [Corrugated] [Stucco Embossed]: [0.010 inch] [0.016 inch] [0.020 inch] [0.024 inch] thick.
6. <Insert jacket type.>

D. Ducts and Plenums, Exposed:

1. None.
2. [PVC] [PVC, Color-Coded by System]: [20 mils] [30 mils] thick.
3. Aluminum, [Smooth] [Corrugated] [Stucco Embossed]: [0.016 inch] [0.020 inch] [0.024 inch] [0.032 inch] [0.040 inch] thick.
4. Painted Aluminum, [Smooth] [Corrugated] [Stucco Embossed]: [0.016 inch] [0.020 inch] [0.024 inch] [0.032 inch] thick.
5. Stainless Steel, Type [304] [316] [304 or 316], [Smooth 2B Finish] [Corrugated] [Stucco Embossed]: [0.010 inch] [0.016 inch] [0.020 inch] [0.024 inch] thick.
6. <Insert jacket type.>

E. Piping, Concealed:

1. None.
2. [PVC] [PVC, Color-Coded by System]: [20 mils] [30 mils] thick.
3. Aluminum, [Smooth] [Corrugated] [Stucco Embossed]: [0.016 inch] [0.020 inch] [0.024 inch] [0.032 inch] [0.040 inch] thick.
4. Painted Aluminum, [Smooth] [Corrugated] [Stucco Embossed]: [0.016 inch] [0.020 inch] [0.024 inch] [0.032 inch] thick.
5. Stainless Steel, Type [304] [316] [304 or 316], [Smooth 2B Finish] [Corrugated] [Stucco Embossed]: [0.010 inch] [0.016 inch] [0.020 inch] [0.024 inch] thick.
6. <Insert jacket type.>

F. Piping, Exposed:

1. None.
2. [PVC] [PVC, Color-Coded by System]: [20 mils] [30 mils] thick.

3. Aluminum, [Smooth] [Corrugated] [Stucco Embossed]: [0.016 inch] [0.020 inch] [0.024 inch] [0.032 inch] [0.040 inch] thick.
4. Painted Aluminum, [Smooth] [Corrugated] [Stucco Embossed]: [0.016 inch] [0.020 inch] [0.024 inch] [0.032 inch] thick.
5. Stainless Steel, Type [304] [316] [304 or 316], [Smooth 2B Finish] [Corrugated] [Stucco Embossed]: [0.010 inch] [0.016 inch] [0.020 inch] [0.024 inch] thick.
6. <Insert jacket type.>

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:
1. Aluminum, Stucco Embossed with Z-Shaped Locking Seam: 0.016 inch thick.

3.17 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

SECTION 232300
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-32:

1. Suction Lines for Air-Conditioning Applications: 185 psig.
2. Suction Lines for Heat-Pump Applications: 325 psig.
3. Hot-Gas and Liquid Lines: 325 psig.

B. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

1.4 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Filter dryers.
3. Strainers.
4. Pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Shop Drawing Scale: 1/4 inch equals 1 foot

2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L (ASTM B 88M, Type A or B).

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.

3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. End Connections: Socket, union, threaded, or flanged.
6. Maximum Opening Pressure: 0.50 psig.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

D. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

E. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.

2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: [40 deg F] <Insert temperature>.
6. Superheat: [Adjustable] [Nonadjustable].
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: [700 psig] [450 psig] <Insert value>.

F. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

G. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

H. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

I. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig (14 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 240 deg F (116 deg C).

2.3 REFRIGERANTS

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. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-Gas and Liquid Lines, and Suction Lines for Air Conditioning and Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

F. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

G. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

H. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Compressor.

I. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

J. Install receivers sized to accommodate pump-down charge.

K. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install

access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install piping per equipment manufacturers requirements and guidelines for slope, distance, changes in direction, changes in elevation and branching.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

Q. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

T. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.

U. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
6. NPS 2 (DN 50): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
7. NPS 2-1/2 (DN 65): Maximum span, 108 inches (2700 mm); minimum rod size, 3/8 inch (9.5 mm).
8. All sizes, provide supports within 12 inches of all changes in direction.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.

2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 233113
METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
3. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Seismic-restraint devices.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment[, seismic restraints,] and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations[, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation] for selecting hangers and supports[and seismic restraints].

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.

c. Speakers.
d. Sprinklers.
e. Access panels.
f. Perimeter moldings.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Mockups:

1. Before installing duct systems, build mockups representing static-pressure classes in excess of [3-inch wg] <Insert static-pressure class>. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

a. [Five] <Insert number> transverse joints.
b. [One] <Insert number> access door(s).
c. [Two] <Insert number> typical branch connections, each with at least one elbow.
d. [Two] <Insert number> typical flexible duct or flexible-connector connections for each duct and apparatus.
e. [One] <Insert number> 90-degree turn(s) with turning vanes.
f. [One] <Insert number> fire damper(s).
g. Perform leakage tests specified in "Field Quality Control" Article. Revise mockup construction and perform additional tests as required to achieve specified minimum acceptable results.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." Provide Drive Slip or Hemmed “S” Slip or approved equal.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." Provide Drive Slip or Hemmed “S” Slip or approved equal.

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. McGill AirFlow LLC.
    b. SEMCO Incorporated.
    c. Sheet Metal Connectors, Inc.
    d. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger Than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing

requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.

2. Maximum Thermal Conductivity:

a. Type I, Flexible: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

3. Sound Absorption Coefficients:

a. Type I, Flexible: NRC minimum 0.70 at 1.5 PCF and 1" thickness.

b. Type II, Rigid: NRC minimum 0.85 at 3.0 PCF and 1-1/2" thickness.

4. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
5. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.

9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.7 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Kinetics Noise Control.
3. Mason Industries.
4. TOLCO; a brand of NIBCO INC.
5. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications 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: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized or ASTM A 492, stainless-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors installed and/or stored on site from moisture, construction debris and dust, and other foreign materials.

1. Cover and seal open ends of ducts with plastic wrap and duct tape.
2. Turn off ventilation system and protect duct interiors from dust infiltration during dust producing activities (e.g. demolition, drywall installation, finishing).
3. At the end of each workday, cover and seal open ends or openings of installed ducts with plastic wrap and duct tape.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with ASCE/SEI 7.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed 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. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.8 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.

B. Supply and Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

    a. Pressure Class: Positive 2-inch wg (500 Pa).
    b. Minimum SMACNA Seal Class: B.
    c. SMACNA Leakage Class for Rectangular: 12.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Constant-Volume Air-Handling Units:

    a. Pressure Class: Positive 2-inch wg (500 Pa).
    b. Minimum SMACNA Seal Class: B.
    c. SMACNA Leakage Class for Rectangular: 12.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Equipment Not Listed Above:

    a. Pressure Class: Positive 2-inch wg (500 Pa).
    b. Minimum SMACNA Seal Class: B.
    c. SMACNA Leakage Class for Rectangular: 12.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

    a. Pressure Class: Negative 2-inch wg (500 Pa).
    b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
    c. SMACNA Leakage Class for Rectangular: 12.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

    a. Type 304, stainless-steel sheet, No. 3 finish.
    b. Welded seams and joints.
    c. Pressure Class: Positive or negative 2-inch wg.
    d. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
    e. SMACNA Leakage Class: 3.

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

    a. Pressure Class: Positive or negative 1-inch wg (250 Pa).
    b. Minimum SMACNA Seal Class: A.
    c. SMACNA Leakage Class for Rectangular: 12.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.

2. Stainless-Steel Ducts:

    a. Exposed to Airstream: Match duct material.

    b. Not Exposed to Airstream: Match duct material.

F. Liner:

1. Supply Air Ducts: Fibrous glass, Type I, 1.5 PCF, 1-1/2 inches thick.
2. Return Air Ducts: Fibrous glass, Type I, 1.5 PCF, 1-1/2 inches thick.
3. Supply Fan Plenums: Fibrous glass, Type II, 3.0 PCF, 2 inches thick.

4. Return-Fan Plenums: Fibrous glass, Type II, 3.0 PCF, 2 inches thick.
5. Outside Air Ducts: Fibrous glass, Type I, 1.5 PCF, 1-1/2 inches thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

   a. Velocity 1000 fpm (5 m/s) or Lower:

      1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      2) Mitered Type RE 4 without vanes.

   b. Velocity greater than 1000 fpm:

      1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

      1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
      2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
      3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
      4) Radius-to Diameter Ratio: 1.5.

   b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
   c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Spot welded seam.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections" and details provided on drawings.

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: 45 degree Lead-In,Low-loss.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and details provided on drawings.

a. All shall be 45-degree lateral.

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Control dampers.
5. Fire dampers.
6. Ceiling dampers.
7. Smoke dampers.
8. Combination fire and smoke dampers.
9. Corridor dampers.
10. Flange connectors.
11. Duct silencers.
12. Turning vanes.
13. Remote damper operators.
14. Duct-mounted access doors.
15. Flexible connectors.
16. Flexible ducts.
17. Duct security bars.
18. Duct accessory hardware.

B. Related Sections:

1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
2. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detectors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

1.5 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. Fusible Links: Furnish quantity equal to [10] <Insert number> percent of amount installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Exposed-Surface Finish: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and No. 3 finish for exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ventfabrics, Ventlok
2. Duro Dyne Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Pottorff; a division of PCI Industries, Inc.
6. Ruskin Company.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 1-inch wg.

E. Frame: 0.052-inch-thick, galvanized sheet steel, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, maximum 6-inch width, [0.025-inch- thick, roll-formed aluminum with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Vinyl foam.

I. Blade Axles:

1. Material: Galvanized steel or Stainless steel.
2. Diameter: 0.20 inch.

J. Return Spring: Adjustable tension.

K. Bearings: Steel ball or Synthetic pivot bushings.

L. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.

    a. Sleeve Thickness: 20-gage minimum.
    b. Sleeve Length: 6 inches minimum.

6. Screen Mounting: Rear mounted.
7. Screen Material: Galvanized steel or Aluminum.
8. Screen Type: Bird.
9. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. 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:

    a. Ventfabrics, Ventlok.
    b. McGill AirFlow LLC.
    c. METALAIRE, Inc.
    d. Nailor Industries Inc.
    e. Pottorff; a division of PCI Industries, Inc.
    f. Ruskin Company.
    g. Duro Dyne Inc.
    h. Greenheck Fan Corporation

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.

4. Frames:

    a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel or Stainless steel.
7. Bearings:

    a. Molded synthetic or Stainless-steel sleeve.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, spring loaded, serrated die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.

2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 CONTROL DAMPERS

1. 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:

    a. Ventfabrics, Ventlok.
    b. McGill AirFlow LLC.
    c. METALAIRE, Inc.
    d. Nailor Industries Inc.
    e. Pottorff; a division of PCI Industries, Inc.
    f. Ruskin Company.
    g. Duro Dyne Inc.
    h. Greenheck Fan Corporation

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. Hat shaped.
2. Galvanized-steel channels, 0.064 inch thick.
3. Mitered and welded corners.

D. Blades:

1. Multiple blade with maximum blade width of 8 inches.
2. Parallel- and opposed-blade design.
3. Galvanized steel.
4. 0.064 inch thick.
5. Blade Edging: Closed-cell neoprene edging.

E. Blade Axles: Galvanized steel; or stainless steel.

F. Bearings:

1. Molded synthetic Stainless-steel sleeve.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.5 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.

2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.6 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
6. Aero Dyne HEP

B. Manufactured Turning Vanes for Metal Ducts: Double wall, hollow metal, airfoil shape blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Double wall.

2.7 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pottorff; a division of PCI Industries, Inc.
2. Ventfabrics, Inc.
3. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass.

D. Cable: Stainless steel.

E. Wall-Box Mounting: Recessed, 2 inches deep.

F. Wall-Box Cover-Plate Material: Stainless steel.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ventfabrics, Inc.
10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

    a. Double wall, rectangular.
    b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    c. Vision panel.
    d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
    e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

    a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
    c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.

2.9 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd..
2. Minimum Tensile Strength: 500 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.11 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
4. J.P. Lamborn Co.

B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.

1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: R-8.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, outside-air and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
   1. Control devices requiring inspection.
   2. Kitchen exhaust ductwork.
   3. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

   1. One-Hand or Inspection Access: 8 by 5 inches.
   2. Two-Hand Access: 12 by 6 inches.
   3. Head and Hand Access: 18 by 10 inches.
   4. Head and Shoulders Access: 21 by 14 inches.
   5. Body Access: 25 by 14 inches.
   6. Body plus Ladder Access: 25 by 17 inches.

J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

K. Install flexible connectors to connect ducts to equipment.

L. Connect terminal units to supply ducts directly.

M. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place Connect flexible ducts to metal ducts with stainless steel bands plus adhesive/sealant

N. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.
   3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
   4. Inspect turning vanes for proper and secure installation.
   5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 233416
CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Backward-inclined centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

   1. Certified fan performance curves with system operating conditions indicated.
   2. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   3. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

   1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA 1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

PART 2 - PRODUCTS

2.1 BACKWARD-INCLINED CENTRIFUGAL FANS

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:

C. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by one of the following:

1. Greenheck.
2. Bayley Fans; a division of Lau Industries, Inc.
3. Carrier Corporation.
4. Loren Cook Company.
5. Trane.

D. Description: Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and support structure.

E. Housings: Formed panels to make curved-scroll housings with shaped cutoff; with doors or panels to allow access to internal parts and components.

1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
2. Horizontally split, bolted-flange housing.
3. Spun inlet cone with flange.
4. Outlet flange.

F. Backward-Inclined Wheels: Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades welded or riveted to flange and backplate; and fastened to shaft with set screws.

G. Shafts: Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

H. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

1. Ball-Bearing Rating Life: ABMA 9, LI0 at [50,000 hours] [120,000 hours] <Insert hours>.

I. Grease-Lubricated Shaft Bearings: Self-aligning, pillow-block-type, tapered roller bearings with double-locking collars and two-piece, cast-iron housing.

1. Ball-Bearing Rating Life: ABMA 9, LI0 at [50,000 hours] [120,000 hours] <Insert hours>.
2. Roller-Bearing Rating Life: ABMA 11, LI0 at [50,000 hours] [120,000 hours] <Insert hours>.

J. Grease-Lubricated Shaft Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.

1. Ball-Bearing Rating Life: ABMA 9, LI0 at [50,000 hours] [120,000 hours] <Insert hours>.
2. Roller-Bearing Rating Life: ABMA 11, LI0 at [50,000 hours] [120,000 hours] <Insert hours>.

K. Accessories:

1. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.
2. Cleanout Door: [Bolted] [Quick-opening, latch-type] gasketed door allowing access to fan scroll, of same material as housing.
3. Scroll Drain Connection: NPS 1 steel pipe coupling welded to low point of fan scroll.

4. Companion Flanges: Rolled flanges for duct connections of same material as housing.
5. Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft for double-width fans.
6. Discharge Dampers: Assembly with [parallel] [opposed] blades constructed of two plates formed around and to shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
7. Inlet Screens: Grid screen of same material as housing.
8. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
9. Spark-Resistant Construction: AMCA 99.
10. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.

L. Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Enclosure Type: Totally enclosed, fan cooled.

2.2 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install centrifugal fans level and plumb.

B. Support suspended units from structure using threaded steel rods and elastomeric hangers, neoprene suspended isolator kit having a static deflection of 1 inch. Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install units with clearances for service and maintenance.

D. Label fans according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to fans to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust damper linkages for proper damper operation.
6. Verify lubrication for bearings and other moving parts.
7. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
8. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
9. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 DEMONSTRATION

A. [Engage a factory-authorized service representative to train] [Train] Owner's maintenance personnel to adjust, operate, and maintain centrifugal fans. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 233723
HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof hoods.
2. Goosenecks.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.5 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by metal producer for required finish.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 zinc coating, mill phosphatized.

D. Stainless-Steel Sheet: ASTM A 666, Type 304, with No.4 finish.

E. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Factory or shop fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

2.3 ROOF HOODS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carnes.
2. Greenheck Fan Corporation.
3. Loren Cook Company.

B. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 5-6 and 5-7.

C. Materials: Galvanized-steel sheet, minimum 0.064-inch-thick base and 0.040-inch-thick hood; suitably reinforced.

D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch-thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 8 inches minimum.

E. Bird Screening: Galvanized-steel, 1/2-inch-square mesh, 0.041-inch wire or Stainless-steel, 1/2-inch-square mesh, 0.047-inch wire.

F. Galvanized-Steel Sheet Finish:

1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat and an overall minimum dry film thickness of 2 mils.

    a. Color and Gloss: As indicated by manufacturer's designations.

2.4 GOOSENECKS

A. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 5-5; with a minimum of 0.052-inch-thick, galvanized-steel sheet.

B. Bird Screening: Galvanized-steel, 1/2-inch-square mesh, 0.041-inch wire or Stainless-steel, 1/2-inch-square mesh, 0.047-inch wire.

C. Galvanized-Steel Sheet Finish:

1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat and an overall minimum dry film thickness of 2 mils.

    a. Color and Gloss: As indicated by manufacturer's designations.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.

B. Install goosenecks on curb base where throat size exceeds 9 by 9 inches.

C. Install gravity ventilators with clearances for service and maintenance.

D. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Division 07 Section "Joint Sealants" for sealants applied during installation.

F. Label gravity ventilators according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories.

3.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

END OF SECTION

SECTION 238126
SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 COORDINATION

A. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 07 Section "Roof Accessories."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Daikin AC
2. Mitsubishi.
3. Carrier.

2.2 CONCEALED EVAPORATOR-FAN COMPONENTS

A. Cabinet: Heavy duty ABS and high impact polystyrene plastic with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

1. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
2. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive, centrifugal fan.

D. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Filters: Permanent, cleanable

2.3 WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Heavy duty ABS and high impact polystyrene plastic with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

1. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
2. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive, centrifugal fan.

D. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Filters: Permanent, cleanable

2.4 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: inverter
2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.

3. Refrigerant: R-32,R-407C or R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to 45 deg F.

H. Mounting Base: Polyethylene.

I. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

2.5 ACCESSORIES

A. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

1. Minimum Insulation Thickness: 1 inch thick where indoors, 1-1/2 inch thick with aluminum jacketing where outdoors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounting compressor-condenser components on equipment supports specified in Division 07 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Install seismic restraints.

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and

return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."

D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

E. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. <Insert startup steps if any.>

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 255000
DIRECT DIGITAL CONTROL AND ENERGY MANAGEMENT SYSTEM

PART 1 - GENERAL

1.01 GENERAL MECHANICAL PROVISIONS:

A. The General Mechanical Provisions of Div 23 shall form a part of this Section with the same force and effect as though repeated here.

1.02 SCOPE:

A. General: The direct digital control and energy management system (DDC/EMS) includes control panels, control devices, valves, actuators, all line and low voltage control and interlock wiring (including wiring to controllers, switches, timers, relays, etc.) and conduit and related equipment, as required for proper operation of all equipment. Provide all equipment, programming, labor, materials and services necessary for a complete, lawful and operating DDC/EMS as shown or noted on the drawings and as specified herein. All control wiring, line and low voltage shall be installed in conduit. Power wiring, power to DDC/EMS control panels and disconnect switches are included in the Electrical Specifications, except that power wiring for control devices such as controllers, valves, etc., is included in the control system. Electrical work shall be in accordance with Electrical Specifications. The system shall be direct digital control/electric. The control system shall be direct digital; Johnson Controls Inc., Facility Explorer FX80 Controls. The system shall be “WebCTRL” based with open license supervisory controller and must be compatible with existing district-wide system. The protocol shall be BACnet. The system shall communicate over the District’s Ethernet LAN/WAN, and shall include the latest upgrading (software and firmware) during the warranty period. The data wiring shall have an Ethernet connection at the DDC/EMS network control panel. A Graphical User Interface (GUI) must reside on the District’s server and be integrated into the District’s current GUI maintained on the District’s server. The design of the total installed system shall be based on such systems, which are the District standards. Coordinate with Division 23, Heating, Ventilating and Air Conditioning and with Division 26. Comply with ASHRAE 55 and Title 24.

B. Contractor Qualifications: All controls shall be furnished and installed by a Contractor who is licensed, certified or contracted by the controls manufacturer for design, installation, start-up and service of their product. The Contractor must have factory supplied training and support. The Contractor must have sufficient personnel to respond to a trouble call at the site within four hours. The Contractor's local manager shall have a minimum of five years experience in the design, installation, start-up and service of similar systems. The Contractor shall submit a list of at least five projects which are similar in size, scope and contract value to

this project. This list shall include the Owner's contact person, phone number and controls contract value.

C. Submittals: Within 60 days of contract award, submit eight (8) copies of shop drawings showing the following aspects of the DDC/EMS system (CAD file with DXF format if required of floor and site plans can be secured from the Architect).
1. All termination points, terminal cabinets, and cabling.
2. Schedule of input and output points.
3. Locations of all visible DDC/EMS system components (i.e. interior and exterior sensors, terminal strips, panels, trench and pull boxes, etc.), identifying specifically any exposed conduit.
4. Descriptive literature for all material and equipment items shall include manufacturer's name and catalog numbers, dimensions, capacities, and all other characteristics and accessories as listed in the specifications or on the drawings.
5. Submit copies of forms to be used for testing and verification showing all data which is to be recorded. Three copies of complete report shall be submitted for review.
6. Sequences of operation for all controlled equipment.

E. Installation and Operation Manuals: Furnish Installation and Operating Manuals for all components. These manuals shall contain full documentation which shall include, without being limited to, the following:
1. General description and specifications.
2. Installation and initial checkout procedures.
3. Complete alignment and calibration procedures for all components.
4. Detailed schematics and assembly drawings.
5. LON and/or BacNET architecture diagrams
6. Sequence of Operations
7. Controller points lists

1.03 SYSTEM ARCHITECTURE

A. DDC/EMS Equipment: The main controller shall contain the network communications and information management programs providing integrated global control, trend logging, local and remote alarming and fully menu driven user interface. The local network controller must be an intelligent, stand-alone microprocessor based controller which can have a variety of configurations based on their application.

B. Campus-Wide Data Transfer System: The DDC/EMS shop drawings shall indicate where all equipment items are to be located for input and output to complete the system. The conduit/cabling system shall inter-tie these points as required to complete one system to meet the design criteria herein. Conduit shall be used for all EMS wiring whenever access is limited (hard-lid, walls, etc). When EMS wiring is installed in/above accessible areas (such as T-bar ceilings), free-air with J-hooks and wire-ties is acceptable. However, EMS wiring cannot be intermixed or

bundled with any other cabling/wiring (Fire Alarm, internet, etc). System high speed communication shall be hardwired using a Belden shielded cable as recommended by DDC manufacturer.

C. User Interface Communication: The user may communicate with the DDC/EMS system with a workstation located at the District Office over the WAN, with a remote workstation, with an On-Campus Operator Workstation, or with a Lap-Top computer (Service Tool).

D. Standard Network Support: All Master Controllers, Workstation(s) and File Server shall be capable of residing directly on the owner's Ethernet TCP/IP LAN/WAN. Furthermore, the Master Controllers, Workstation(s) and File Server shall be capable of using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs. With this design the owner may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the owner's Information Technology Department as all devices utilize standard TCP/IP components. If the DDC/EMS contractor needs an additional data port that is not already provided, its installation must be coordinated with the District's IT department (and IT infrastructure contractor if applicable) and will be installed and the DDC/EMS contractor's expense. As a result, the DDC/EMS contractor needs to ensure any additional data port locations are clearly indicated and that the existing EMS data ports they intend to utilize are addressed/identified prior to construction so they are not damaged or removed. This coordination should occur between the District's Construction Office, IT department, DDC/EMS operator, IT infrastructure contractor (if applicable), and the project's general construction contractor manager.

PART 2 - PRODUCTS

2.01 GENERAL:

A. General Requirements: The Electronic Microprocessor Based Direct Digital Control and Energy Management System (DDC/EMS) shall monitor the data environment and perform control functions in relation to a programmed strategy and the status of the data environment. The system shall use solid state computer-based digital and analog technology. The system shall be standard with the manufacturer to insure on-going parts availability and trained technical support. The DDC/EMS shall be of the user programmable type requiring no special computer education for operation. All necessary instruction manuals and user orientation training shall be supplied by the manufacturer or agent thereof. The DDC/EMS shall be UL listed as a Direct Digital Control and Energy Management System. The programmable control requirements of the DDC/EMS shall include, but not be limited to:

SCHEDULED OCCUPANCY ROUTINES INCLUDING HOLIDAYS
CUSTOM TAILORED REPORTING

ACCUMULATING RUN TIME
CRITICAL CONDITION ALARMING
FLUID FLOW SWITCH AND CONTROL ALARMING
PID CONTROL ON ANALOG OUTPUTS
HOT WATER RESET
CHILLED WATER RESET
DAY/NIGHT SETBACK
ECONOMIZER/PURGE
POINT OVERRIDE ABILITY FOR EVERY DIGITAL AND ANALOG OUTPUT
SEPARATE MODES AS REQUIRED BY CONTROL SEQUENCE
ALL EXTERIOR LIGHTING CIRCUITS CONTROLLED BY SYSTEM

B. Environment: The DDC/EMS shall operate in an environment of 40-120 degrees F and 10-95% relative humidity. Sensors and control elements shall operate under the temperature, pressure, humidity, and vibration conditions normally encountered in the installed location. The DDC/EMS shall maintain accuracy as follows:
1. +/- 0.5 F for the space temperatures in the 0 F - 130 F range.
2. +/- 0.5 F for duct temperatures in the 40 F - 130 F range.
3. +/- 1.0 F for outside air temperatures in the -30 - 230 F range.
4. +/- 1.0 F for water temperature in the 30 - 230 F range.
5. KWH and KW monitoring within 1.0%.

C. Battery Backup: The system shall be tolerant of power failure and hold memory for a minimum of 12 hours. On power restoration, the system shall automatically and without operator intervention of execution of manual restart procedures:
1. Come On Line.
2. Update all monitored functions.
3. Resume operation based on current time and status.
4. Implement special building start-up strategies as required.
5. Log time of power outages and start-ups.

D. Program Storage: The system shall also be capable of interfacing with a mass storage device, for use in uploading and downloading programs to the DDC/EMS.

2.02 SYSTEMS DESCRIPTION:

A. Modular Design/Expandability: The DDC/EMS shall be of a modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions. The modular DDC/EMS shall be configured on the main/local concept. The main controller shall have the capability of adding local controllers and the local controllers shall be capable of adding I/O modules.

B. Main (Master) Description: The master shall function as the overall system coordinator, accept control programs, perform automated energy management functions, control peripheral devices and perform all necessary mathematical

calculations. The master shall be a microcomputer of modular design. The word size shall be 16 bits or larger, with a memory cycle time less than 1 microsecond. All chips shall be second sourced. The master shall have the following:

1. Protected Access: Key lock protected access to output override switches and internal circuitry.
2. Memory: The master shall have memory required for systems operation and diagnostics or MCP software.
3. Real Time Clock: The master shall have a battery backed uninterruptable "Real Time Clock". The accuracy shall be within ten seconds per day. The RTC shall provide the following information: Time of Day, Day, Month, Year, and Day of Week. The system shall be programmed to automatically correct the clock for day-light savings time and leap years and Time Sync with the District's server.
4. Power: The master shall operate from 120 VAC +/- 20%, 60 Hz. Line voltages below the operating range of the system shall be considered outages. The master shall have over voltage surge protection, and require no additional AC power signal conditioning.
5. Parallel Processing: The master shall be capable of parallel processing, executing separate control programs simultaneously. Any control program may affect control of another program if desired. Each program shall have full access to all I/0 facilities of the processors.
6. Communications Processor: Each master shall provide communication to the District's server, Workstation(s) (LAN) and the field buses. In addition, each master must have communications ports that support portable service tool and connection to third party controllers such as a chiller control panel or Variable Frequency Drives.
7. Uninterruptable Functions: Control functions shall not be interrupted due to program entry or other user communications.

C. Local Controller Units: The local units function as a stand-alone controller and as an Input/Output interface of the DDC/EMS and the Data Environment.

1. HVAC units must be fully controlled by a controller connected to the DDC/EMS that can be fully programmed by the DDC/EMS contractor.
2. Monitoring: Local units shall be used to connect the data environment to the system and contain all necessary Input/Output functions to read field sensors and operate controlled equipment based on internal instructions or instructions from the Master. The units shall be fully supervised to detect failures. The units shall report the status of all points in its data environment at the rate of at least once every second. Local units shall connect directly to the Master with a twisted pair shielded RS-485 interface.
3. Unit Failure: Upon failure of the unit (including transmission failure), the unit shall automatically fail off or to a predetermined state for three-way valves. All local units must run independently in the event of a central unit failure (including transmission failure) in bypass mode via the thermostat.
4. Power: The unit shall operate from 120 VAC, +/-20%, 60 Hz, 220 VAC, +/-20%, 50 Hz or 24 VAC +/- 20%, 50/60 Hz power. For voltages below the

operating threshold the unit shall totally shutdown and de-energize its outputs.

5. LAN and/or Field Bus: Each unit shall communicate with any unit through the RS-485 interface LAN and/or field bus.
6. Auxiliary Port: Each unit shall be equipped with an auxiliary port to allow local interrogation of input and output values, and keyboard override of outputs through laptop.

2.03 INPUT/OUTPUT CAPABILITY:

A. Inputs: The DDC/EMS shall accept information in the form of a temperature, voltage, digital signal (on-off) or pulse counter.
   1. Analog Inputs: The Analog Input (AI) function shall monitor each analog input, perform A/D conversion, and hold the digital value in a buffer for interrogation. The A/D conversion shall have a minimum resolution of 10 bits. Input ranges shall be within the range of 0-10 VDC.
   2. Digital Inputs: The Digital Input (DI) function shall accept dry contact closures and voltage level or resistance level (5VDC reference voltage) transitions. A voltage level below 1 volt or a resistance below 500 ohms shall be read as ON (closed), a voltage level above 3 volts or a resistance above 1400 ohms shall be read as OFF (open).
   3. Pulse Accumulator Inputs: The pulse accumulator function shall have the same characteristics as the DI, except that, in addition, a buffer shall be included to totalize pulses between interrogations. Each input shall accept pulses at a minimum of 2 per second.
   4. Temperature Inputs: Temperature inputs originating from a thermistor shall be monitored and buffered as an AI, except that, automatic conversion to degrees F shall occur without any additional signal conditioning.
   5. Input Wiring: All analog inputs shall be two wire devices, with shielded wire for accurate operation.

B. Outputs:
   1. Master and local controllers - Form C relay outputs rated at 5 amp, 24 VAC/DC or 2 amp, 30 VAC for on/off or Pulse Width Modulation for maintained operation of field devices. Output pulse width shall be selectable between 0.1 and 3200 seconds with a minimum resolution of 0.1 seconds. Isolation and protection against voltage surges shall be provided. Central plant controllers shall be equipped with an ON/OFF/AUTO switch to manually obtain either output state. Manual overrides shall be reported to the master at each update. An LED shall be provided to indicate the state of each digital output.
   2. All digital and analog output points on every controller must have an override (highest priority) input point in the controller’s point list in the JACE. This override point must be clearly labeled and identifiable. For example, “DO1ovrd” would be the point to override Digital Output 1.

2.04 SOFTWARE:

A. User Software: Provide software (required upgrades) for Laptop Computer (Service Tool), District office workstation, District server.

B. Software Features:

1. Mathematical Requirements: The DDC/EMS shall have a math package capable of addition, subtraction, multiplication, division, square root, greater than and less than functions, minimum and maximum selection functions, and up to five levels of parenthesis for computation of variables. Control commands may be executed based on these calculated variables which are available to the program on a global basis. Math expressions may be used in action and exit commands of control program. The mathematical software shall be capable of mixed mode arithmetic, utilizing Boolean logic statements in combination with basic arithmetic to provide conditional mathematical computations.
2. Passwords: The DDC/EMS shall have multiple levels of user programmable passwords in addition to a master password, for programming security. Separate passwords may be user programmed. Level of password will define user's access level and ability to change system.
3. Trend Logging: The DDC/EMS shall trend log variables. Any system variable (inputs, outputs, numerals, can be trend logged.
4. Messages: The DDC/EMS shall provide alarming, preventative maintenance and status reporting messages.
5. Documentation Format: The programming language of the DDC/EMS shall be plain English based such that a printout of the control program shall serve as the primary documentation for the system.
6. Micro Processor Integrity Checking: Each DDC/EMS microprocessor shall continuously monitor and check itself and produce error messages in the event of a malfunction.
7. Data Plotting: The DDC/EMS shall provide plots of values of system variables on a graph. Graphs may consist of combinations of up to 3 system variables at a time from the history logs.

C. Color Graphics Requirements Provide color graphics which allow user to access and change (based on user access level) all schedules, set points, and all digital and analog outputs directly through the user graphics. Real time data shall continuously be updated. Navigation between the screens (forward and backwards) shall be accomplished with the use of a mouse. The minimum graphic screens shall include the following:

1. Site lay-out locations of all equipment being controlled, control component locations, and spaces served. Provide multiple screens-minimum of 1 screen per building plus site and others as needed for clarity. By "clicking" mouse on the desired equipment area a flow diagram will be displayed for

the related equipment (as described below - Item 2). By "clicking" the mouse on a conditioned space, a graphic display of the zone conditions (as described below - Item 3) will be displayed.

2. Each building must have a graphical summary page of all the zones in that building that displays zone temperature, set point, discharge air temperature, and fan command.
3. Zone & HVAC Equipment Description on GUI: Each item of HVAC equipment must be clearly identified by what area it serves and its unit number. For example, if HC-2A serves Classroom 4, the GUI should list it as “Classroom 4, HC-2A.” It should NOT be listed as only “HC-2A” or “Classroom 4.”
4. Flow diagrams shall be provided for each HVAC system, such as air-handling system, chilled water system, hot water system, condenser water system, package unit system, brine system with all inputs and outputs dynamically displayed.
5. Each temperature control zone shall have a screen providing set points, temperatures, and related HVAC system status data.
6. Scheduling screens allowing On/Off times to be set.
7. Automatic demand shed controls: Provide “Disabled”, “Manual Control” and “Automatic Demand Shed Control” selection buttons for automatic demand shed control to meet Title 24 requirements. Demand shed control shall reset all cooling setpoints 4°F above default setpoint.

D. Software Manual: The software manual shall describe programming and testing, starting with a system overview and proceeding to a detailed description of each software feature. The manual shall instruct the user on programming or reprogramming any portion of the system. This shall include all control programs, variables, set points, time periods, messages, passwords and other information necessary to load, alter, test and execute the system. The manual shall include commands, editing and writing control programs, printouts and logs, mathematical calculations, and instructions on modifying any control point, verifying error status, changing passwords, and initiating or disabling control programs.

E. Software Licenses: The owner shall be named the license holder of all software associated with any and all incremental work on the project(s). The intent is to insure that the installed JCI FX products be completely open for integrations. Owner shall be free to direct the modification of the software license, regardless of supplier. In addition, the Owner shall receive ownership of all job-specific software configuration documentation, data files, and application-level software developed for this project. This shall include all custom, job-specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use within JCI Facility Explorer (FX) based controllers and/or servers and any related LAN/WAN/Intranet and Internet connected routers and devices. Any and all required IDs and passwords for access to any component or software program shall be provided to the Owner.

2.05 USER INTERFACE:

A. LAN Connections: If an additional LAN connection is needed, the conduit and cable from LAN rack is to be installed by electrical contractor. The planned location of all LAN connections (new and existing) to EMS equipment must be coordinated with the District's networking staff and EMS staff as early as possible. Final connections will be made by DDC/EMS Contractor.

B. Direct Computer Communication: The DDC/EMS shall have a computer compatible communication mode for communication with other intelligent devices, which performs data integrity checking, with automatic retransmission of data when errors are detected.

C. JACE software must include all applications to make all folders viewable and accessible in the JACE. Install DDC/EMS software on server, and furnish Software license to District. Coordinate hardware requirements with District.

2.06 SYSTEM COMPONENTS:

A. Control Components:
   1. Wall Switches: Plates for all wall switches and timers shall match those specified in Division 26.
   2. Labels: All labels, signs, etc. shall be engraved, laminated plastic, white on black background, 1/8" high lettering, minimum.
   3. Temperature Sensors:
      a. Sensor Type: All temperature sensors shall be made of a highly stable, precision thermistor material accurate to within ±0.36 Degrees F. Identify each temperature sensor with a "Lamicoid" label keyed to the control system as-built drawings.
      b. Room Sensor: Room temperature sensor shall have Executive Decorator housing with programmable visible temperature indication. Housing shall include an occupancy override, temperature setpoint adjustment and a service tool jack.
      c. Vandal Resistant Room Sensor: Where noted, shall be a blank stainless steel wall plate with the sensing element bonded to the back side. The plate back shall be insulated to reduce wall temperature influence.
      d. Duct Sensor: Duct temperature sensor shall be a probe type element with 9 inch insertion length. Element shall be installed where air mixture provides a true temperature indication. Where adequate mixing is not practical, the duct temperature sensor shall have an averaging type thermistor element, installed across the entire cross section of the duct.

e. Outdoor Air Sensor: Outdoor air temperature sensor shall be a probe type element mounted in a ventilated, treated white PVC sun shield to minimize radiant energy effects. The sensor and sun shield shall be mounted on a weatherproof outlet box for outdoor installation.

f. Low Differential Air Pressure Applications (0” to 5” W.C.): The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points. Non-interactive zero and span adjustments, adjustable from the outside cover. (0.00 - 1.00” to 5.00”) W.C. input differential pressure ranges. 4-20 mA output. Maintain accuracy up to 20 to 1 ratio turndown. Reference Accuracy: +0.2% of full span.

g. CO2 Sensor: The sensor shall have a five year recommended calibration interval. In addition, the sensor shall be provided with a five-year calibration guarantee, providing for free factory replacement if the sensor is found to be out of calibration within five years of the purchase date. The sensor shall have accuracy of ±50 ppm and repeatability of ±20 ppm. All adjustments to the sensor including output scaling, elevation adjustment, relay set point, relay dead-band, linear or exponential output, and single point calibration shall be made via on-board push buttons and LCD display. The LCD display must be covered by a solid door and only viewable when the door is opened for adjustments.

4. Temperature Control Panels: Each panel and each control device or readout on the front of the panel shall be identified with a laminated plastic label with 1/4" high engraved lettering, white on black background. Pilot lights shall be the push-to-test type.

5. Smoke Detectors: Furnished and installed by Division 26. Power and fire alarm wiring by Division 28. Control wiring by Division 23. Coordinate with Division 26.

6. Status Sensor: Current sensing status sensor (with sensitivity adjustment for belt loss detection).

7. Electric Actuators:

a. General: Fully modulating, UL listed. Visual position indicator, manual override and clear weather shield where exposed to weather. 24 volt. Belimo.

B. Lighting Contactors: Lighting contactor with metal enclosure will be furnished, installed, and wired to the lighting panel by the electrical contractor. See electrical contract documents for location. The DDC/EMS Contractor shall provide low voltage relay(s) required at the contactor panel and wire to the contactors to complete the DDC/EMS side of the lighting control. DDC/EMS Contractor shall provide required photo cells. Relays shall be suitable for up to 277 volts.

C. Lightning Arrestor and Surge Suppressors: Shall be provided as approved and/or manufactured by the DDC/EMS equipment manufacturer.

D. Conduit: Conduit to be a minimum 1" diameter, and to have at least 25% spare capacity, except drops to room sensors may be run in ½" conduit. Conduit shall be run in electrical or mechanical trenches wherever possible. Site conduit (building to building) will be installed (and terminated inside the building) by Division 26.

2.07 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
4. Spring-Return Motors for Valves Larger Than NPS 2-1/2: Size for running and breakaway torque of 150 in. x lbf.
5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Available Manufacturers:

   a. Belimo Aircontrols (USA), Inc.

2. Valves: Size for torque required for valve close off at maximum pump differential pressure.
3. Dampers: Size for running torque calculated as follows:

   a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
   b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft. of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
   e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
   f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.

4. Coupling: V-bolt and V-shaped, toothed cradle.
5. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
6. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
7. Power Requirements (Two-Position Spring Return): 24-V ac.
8. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
9. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
10. Temperature Rating: Minus 22 to plus 122 deg F.
11. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F.
12. Run Time: 12 seconds open, 5 seconds closed.

2.08 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.
2. NPS 2-1/2 and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.
3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.

    a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
    b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.

4. Sizing: 2-4 psig maximum pressure drop at design flow rate or the following:

    a. Two Position: Line size.
    b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more. No less than 2 nominal pipe sizes smaller than branch line serving valve.
    c. Three-Way Modulating: Twice the load pressure drop, but not more than value specified above. No less than 2 nominal pipe sizes smaller than branch line serving valve.

5. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.

C. Butterfly Valves: 200-psig maximum pressure differential, ASTM A 126 cast-iron or ASTM A 536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.

1. Body Style: Wafer or Lug.
2. Disc Type: Nickel-plated ductile iron or Aluminum bronze
3. Sizing: 1-psig maximum pressure drop at design flow rate, no less than 2 nominal pipe sizes smaller than branch line serving valve.

D. Terminal Unit Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.

1. Rating: Class 125 for service at 125 psig and 250 deg F operating conditions.
2. Sizing: 2-4 psig maximum pressure drop at design flow rate, to close against pump shutoff head, no less than 2 nominal pipe sizes smaller than branch line serving valve.
3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION:

A. General: All electrical work shall be in accordance with the California Electrical Code and the Electrical Specification Sections. All electric/electronic systems shall be hardwired in conduit. When EMS wiring is installed in/above accessible areas (such as T-bar ceilings), free-air with J-hooks and wire-ties is acceptable. However, EMS wiring cannot be intermixed or bundled with any other cabling/wiring (Fire Alarm, internet, etc). Wiring shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed wiring shall run parallel to room surfaces; location shall be approved by the Architect. No structural member shall be weakened by cutting, notching, boring or otherwise. Provide a 120 volt circuit for each device requiring external power. Dedicated circuits shall be provided where required. Any devices or wiring exposed to the weather shall be protected in weatherproof enclosures such as NEMA 3R and weatherproof conduit.

B. Labeling of System: DDC/EMS Contractor shall provide complete labeling of all terminals at all panels or equipment terminal strips and wiring equal to Brady marking on wires and number on terminals in sequence corresponding to control diagram.

C. Programming:

1. The Direct Digital Control and Energy Management System (DDC/EMS) operational program shall be provided by the DDC/EMS Contractor. The DDC/EMS Contractor shall be responsible for programming the system and shall coordinate the scheduling (on/off times) with the Owner. Prior to start-up, the DDC/EMS Contractor shall provide any testing program he feels necessary to fully test the operation of the various components.
2. The DDC/EMS Contractor shall load the operational program into the DDC/EMS controller from his office via the District's network (via VPN) or at the job site via a direct connect cable. Prior to starting up the system, the DDC/EMS Contractor shall:
    a. Confirm that the control system has been connected to the District's LAN/WAN and that the LAN/Wan is working.
    b. Confirm the functionality of the DDC/EMS controllers and all input points by reading the input values, and comparing them with a measured temperature, pressure, voltage, current, or resistance as appropriate. Calibrate all transducers as required.
    c. Confirm the functionality of all digital output points by manual operational of the relay contacts. Use proper discretion in starting and stopping equipment.
    d. Confirm the functionality of all analog output points by manually imposing an adjustable voltage on the appropriate circuit to check proper operation of the controlled device. Calibrate all transducers as required.
    e. The DDC/EMS Contractor shall notify the General Contractor (one week in advance of) when the system will be ready for loading and testing the operational program. The DDC/EMS Contractor's start-up technician shall be present while the program is being loaded and shall communicate with the programmer prior and after program loading to confirm proper operation.

D. Training: Prior to final acceptance, the DDC/EMS Contractor shall provide operational training to the Owner's personnel. The training sessions shall include a complete demonstration of the system. Dates and times of the training sessions shall be coordinated through the Owner not less than one week prior to session. A total of 40 hours of instruction shall be provided. The DDC/EMS Contractor shall maintain a log of training sessions including dates, times and names/titles of those attending. The DDC/EMS Contractor shall submit a copy of this log on request.

E. Testing and Acceptance: The DDC/EMS Contractor shall furnish a complete and operating system. The DDC/EMS Contractor shall also verify, in the presence of the Owner, the system accuracy and proper function of each controlled device and sensor. The following items shall be successfully demonstrated prior to acceptance by the Owner:

1. All system outputs including controllers, relays, and other control devices shall be addressed and start/stop functions demonstrated.
2. All inputs shall be displayed and all event-initiated functions shall be demonstrated.
3. Demonstrate program integrity and power restore sequence during and after a power failure and restoration.
4. Deliver all Record Drawings, wiring diagrams, equipment specifications, installation and Operation Manuals and other documentation as required to describe the system.
5. Complete operator training in the use, programming, and operation of the system.

F. Start-up of the System:
   1. The start-up period starts when the following conditions are met:
      a. The DDC/EMS system and all involved HVAC equipment have been installed, connected to the DDC/EMS system and are ready to operate.
      b. A start-up meeting has been conducted with representative of the General Contractor, Architect/Engineer, maintenance staff, and the DDC/EMS Contractor.
      c. Consensus is reached, by the representatives at the above referenced meeting that it is appropriate for the start-up process to start.
   2. The alarm pagers called by the control system during the start-up period shall be the pagers carried by the Mechanical Contractor and/or DDC/EMS Contractor as appropriate. The Mechanical Contractor and DDC/EMS Contractor shall respond to all pages from the control system and work cooperatively to insure that the building environmental standards are maintained.
   3. The start-up process shall be completed and the warranty period shall start when the following conditions are met.
      a. All training to be provided as part of the project has been completed.
      b. No "alarm" or "condition reports" are being generated by the DDC/EMS system for seven (7) calendar days (168 hours) due to incomplete or inaccurate installation or programming.
      c. All adjustments and "fine tuning" of the system have been completed.

G. Verification: A written testing and start-up report must be submitted for approval before acceptance. In addition to the DDC/EMS Contractor's testing and start-up report, the Owner may independently verify the test results. The report on test results shall include setpoints and operating ranges of all components.

END OF SECTION

SECTION 260000
SUMMARY OF ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. In general, the Electrical Work described herein consists of the modification of existing electrical, lighting and signal systems in place and the installation of new electrical, lighting and signal systems equipment. All work shall be completed as directed by the Owner's authorized representative, in accordance with the Contract, Specifications and Construction Documents listed below.

1. General Conditions of Contract

2. Specifications:

Section	Title
260000	Summary of Electrical Work
260100	General Conditions for Electrical Work
260500	Basic Electrical Materials and Methods
260526	Grounding
262416	Panelboards
265113	Lighting
266100	Lighting Control Systems
269500	Electrical Acceptance Tests
272000	Telecommunications System
283100	Fire Alarm System

3. Electrical Construction Drawings as listed on the Drawing Index of the Construction Drawing set:

Number	Title
E100	Overall Electrical Site Plan
E101	Electrical Site Plan
E210	Power Plan
E230	Roof Power Plan
E310	Lighting Plan
E410	Signal and Communications Plan
E510	Fire Alarm Plan
E600	Electrical Details
E700	Single Line Diagram

E710	Fire Alarm Riser Diagram and Calculations
E800	Electrical Symbol Legend and Schedules
E801	Panel Schedules

B. This Section includes all necessary and required work to complete the construction as indicated in the Drawings, called for by notes or schedules, or specified herein. This work includes the furnishing of all permits, labor, supervision, services, materials, tools, equipment, testing, transportation and miscellaneous expenses, and the performance of all operations necessary to or incidental to completion of lawful and operating electrical power, lighting and signal systems, whether or not specifically mentioned.

C. All work not shown in complete detail shall be installed per the 2022 California Electrical Code and in conformance with the best standard practice for the trade. Any deviation from the approved Drawings shall be submitted in writing to the Engineer and Owner for approval prior to the installation of the work in question.

D. This work shall include, but not necessarily be limited to, the following elements:

1. Electrical Distribution:

    a. Power distribution system, as shown, complete with panelboards, conduits, feeders, pull boxes, fittings and related equipment and equipment pads.

    b. Trenching, conduits and feeders for electrical power.

2. Grounding

    a. Grounding system including installations of ground rods, ufer grounds, and ground rings, as shown. Connections to water and/or gas piping and building steel.

    b. Provide the following grounding electrodes at each building, bonded together to form the grounding electrode system:

        1) Metal underground water pipe in direct contact with the earth for ten feet or more and electrically continuous to the points of connection of the grounding electrode conductor and the bonding conductors.

        2) The metal frame of the building, where effectively grounded.

        3) Concrete encased electrode (Ufer ground) consisting of a minimum of 20 feet of bare copper conductor (size 4 minimum) encased by a minimum of 2 inches of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth.

        4) Ground rod of copper clad steel, minimum ¾ inch diameter, minimum 10 feet long, driven full length into the earth. If a maximum resistance to ground of 5 ohms cannot be obtained with a single ground rod, provide additional ground rods installed not closer than 6 feet apart until a maximum resistance to ground of 5 ohms is obtained.

    c. Provide a main ground bus cabinet in the main switchboard room. Provide ground bus cabinets in electrical closets connected to the main ground bus cabinet with a #3/0 copper conductor. Above ground connections of

underground cables to equipment and/or structural steel as shown on the Construction drawings and as required by Code.

d. Bonding of adjacent modular buildings.

e. Testing of grounding system as outlined in Section 269500.

3. Signal Distribution:

a. Trenching, conduits and conductors for signal systems.

b. Building mounted conduits and conductors for signal systems.

c. Trenching and conduits for control systems as required by Divisions 21-25 Specification Sections.

4. Building Electrical and Mechanical Systems:

a. Complete system of branch circuit wiring, conduit and distribution equipment for lighting, receptacles and power.

b. Electrical work associated with mechanical equipment, including conduit, conductor, disconnect switches and motor starters.

c. Connection to all equipment as furnished by other Sections of these Specifications or as listed on Drawings as furnished by Owner.

5. Lighting:

a. Provide complete lighting system including fixtures, hangers, lamps, wall switches and lighting controls.

b. Provide complete Lighting Control System consisting of motion sensors, timer switches and other controls as shown in Drawings.

6. Data Distribution System

a. Complete Data system per Specification Section 272000 including IDF and/or MDF cabinets complete with Switches, Hubs, Category 5 and Fiber Optic Patch Panels and required Patch Cables, Category 5 Data Cable and Jacks, Fiber Optic Cable, Jacks and Innerduct, access panels, terminal cabinets, conduit, wiring and terminations for a complete working system.

b. Extension of existing Data system.

c. Provide new two-compartment power/data raceway, as shown on Drawings. Transfer existing Data system cables and jacks to the new raceway.

7. Fire Alarm System:

a. Pre-testing of existing Fire Alarm system prior to initiation of Fire Alarm work or other work that may affect Fire Alarm system.

b. Complete Fire Alarm system per Specification Section 283100 including Fire Alarm Control Panels, Signal Expander Panels, initiation devices, signal devices, control devices, annunciators, access panels, terminal cabinets, conduit, wiring and terminations and equipment for a complete working system.

c. Installation of two (2) Type RJ31X Telephone Jacks at Fire Alarm Control Panel location and wiring back to Main Telephone Backboard.

d. Extension of existing Fire Alarm system.

e. Completely remove existing Fire Alarm system **EXCEPT** for existing Heat Detectors and Horns in the modular classrooms. Re-circuit existing Heat Detectors and Horns in modular classrooms per Drawings.

8. Equipment Connections

a. Provide equipment connections and coordination in accordance with manufacturer's recommendations and product submittals.

b. Provide equipment connections and disconnect switches as required for the following equipment:

1) Mechanical equipment.

2) Owner furnished equipment.

E. Products supplied by Owner (or others, as noted) and installed by Contractor under this Section.

1. None.

F. Products supplied by Contractor but not installed under this Section.

1. None.

G. Work specifically **excluded** from this Division.

1. Furnishing of motors.

2. Work performed under SECTION 13120, PRE-ENGINEERED FABRICATED STRUCTURES, shall be **EXCLUDED** from this Section.

H. The following Sections contain requirements that relate to this Section:

1. None

I. It shall be understood that the existing conduit with its wiring is presently active (hot), in operation with its pertinent equipment.

J. It shall be noted that this construction work will be planned and executed during ongoing operation of the facility. Any modifications to the existing equipment currently in operation shall be done during scheduled shutdowns and coordinated with the Owner's authorized representative and facility operating personnel to assure minimum downtime.

K. In order to avoid disruption to facility operations, certain items of work must be completed before other items of work can be started. Contractor shall coordinate with the Owner's authorized representative as to the sequence of construction activities.

L. Drawings showing equipment layout, conduit runs, conduit sizes, number of wires, wire types, wire groupings and size will not be furnished. It shall be the Contractor's

responsibility to prepare such drawings in accordance with specifications, project requirements and code to facilitate the installation.

M. Coordinate with the civil engineer to locate the concrete pad and the knock out box in the pad for the high voltage conduits and electrical power circuits.

N. Furnish, install and connect an underground grounding system, specifically mentioned on drawings as part of this contract, including all necessary materials and connections as required by code and/or as shown on the construction drawing.

O. Furnish, install and connect all above grade grounding materials and make aboveground connections of underground cables to equipment and/or structural steel as shown on the construction drawings and as required by code.

P. Size, furnish, install and connect new conduit, conduit fittings, and seal fittings, expansion fittings and supports. This includes above grade as well as underground.

Q. Size, furnish, and install junction, pull and terminal boxes, in accordance to code requirements and as shown on the construction drawings.

R. Size, furnish and install all supports required for conduit installation, supports required for the installation of the equipment furnished by this Contractor and equipment furnished by others but installed by this Contractor.

S. Size and field cut the openings for conduits passing through building walls and/or floors. Close and seal all openings after conduits have been installed and/or removed. Closing shall be compatible with, or of the same material as wall and/or floor.

T. Furnish and install permanent "DANGER - HIGH VOLTAGE" warning signs for the outdoor and indoor switchgear, all unit substations, motor control centers, power distribution panels, and on all doors of all electrical equipment rooms, fenced yards, etc.

U. Furnish and install markers indicating voltage levels (e.g., 12.47 KV, 277/480V, 120/208V, etc.) for all of the electrical equipment such as motor control centers, local lighting panels, lighting transformers, power panels, switchboards, etc....

V. Furnish and install new nameplates per specifications on new motor control centers, motors and on all local control stations, control panels, disconnect switches, push button stations, instrument devices, etc.

W. Furnish and install wire tags in accordance with the specifications indicating wire number as shown on electrical schematics, one line, three line diagrams and specifications.

X. Furnish, install and connect all power, control and instrumentation cable, including all necessary cable lugs, connectors and terminations.

Y. Perform all testing per the Specifications (including generator cables) and report to Owner's field representative in a timely manner so as not to impede the scheduled completion of the Contract.

Z. Furnish all material, labor and testing equipment necessary to check out and test the complete power distribution, control and pneumatic systems for all process and utility equipment in strict accordance with specifications. This shall include check out/start up of systems and/or equipment as directed by Owner.

AA. Prime paint all uncoated carbon steel items furnished by Contractor.

BB. Energize low voltage services after testing equipment and wiring in accordance with manufacturer instructions and specifications.

CC. Provide four ¾" 10 ft copper ground rods, Cadweld the ground rods to the bare copper #4/0 ground ring. Install a ground rod for each of the generators. Connect ground cable to existing grounding loop at the facility

DD. Provide a NEMA L5-30 extension cord to the electrical power circuit of each generator to maintain the battery charging circuits.

EE. Electrical contractor shall coordinate with the utility and the facility personnel to schedule an outage to terminate cables at the main bus in the existing main switchboard.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 260000

SECTION 260100
GENERAL CONDITIONS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. The provisions of this Section shall apply to all of the following Sections of Divisions 26-28 of these Specifications and shall be considered a part of these Sections.

1.3 QUALITY ASSURANCE

A. All work and materials shall fully comply with current rules and regulations of all applicable codes. Nothing in these Drawings or Specifications shall be interpreted as to permit any work not in compliance with these codes. Where work is detailed and/or specified to a more restrictive standard or higher requirement, that standard or requirement shall govern such work. Applicable codes include, but are not limited to, the following:

1. California Code of Regulations (CCR)
    a. Title 8, Industrial Relations
    b. Title 17, Public Health
    c. Title 24, Building Standards
2. 2022 California Building Code.
3. 2022 California Fire Code.
4. 2022 California Electrical Code.
5. Local Codes.

B. All electrical components, devices and accessories shall be listed with Underwriters Laboratories, Inc. (or other testing agency acceptable to authorities having jurisdiction), shall meet their requirements, shall bear their label wherever standards have been established and label service is regularly furnished by that agency, and shall be marked for intended use.

1.4 PERMITS, FEES AND TAXES

A. The Contractor shall secure all necessary permits and pay all required fees and taxes. He shall notify the proper authorities and have the work inspected and tested as required by jurisdictional requirements, pay all charges in connection therewith, and shall present to the Owner properly signed certificates of inspection. Acceptance of the work will not be considered until such certificates have been delivered.

B. The Owner shall pay all utility company charges related to the new services. This shall include any required street lighting charges.

1.5 TEMPORARY UTILITIES

A. The Contractor shall fulfill utility requirements for and pay all one-time and monthly charges for temporary construction utility usage.

B. There is no existing onsite power available to the Contractor for construction. The Contractor shall schedule his work such that the Medium and Low Voltage Electrical work is completed prior to needing onsite electrical power for jobsite trailers and/or construction equipment. The Contractor shall then use the Medium and Low Voltage power distribution system to provide construction power. The Contractor shall supply any supplemental temporary facilities required to provide construction power to the site (i.e. transformers, panels, outlet boxes).

1.6 EXISTING CONDITIONS

A. The Contractor shall carefully examine the site and existing buildings, compare them with Drawings and Specifications, and shall have satisfied himself as to the conditions to be encountered during the performance of the work. No subsequent allowance shall be made on his behalf for any additional expense he may incur due to failure or neglect of Contractor to examine site and to include existing conditions in bid.

B. Any work done as an addition, expansion, or remodel of an existing system shall be compatible with that system.

C. The Contractor shall examine all record drawings made available by the Owner to locate existing underground systems, utilities, conduits, and pipes prior to installing the electrical distribution system. The Contractor shall also examine the site for possible locations of sprinkler pipes. Any damage done to the existing systems during the course of the electrical work, whose locations could be reasonably determined, shall be repaired to the satisfaction of the Owner and the utility or agency involved, at the expense of the Contractor.

1.7 CONDUCT OF THE WORK

A. The Contractor shall maintain on the job a competent foreman or a superintendent at all times to superintend the Work.

1.8 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. The Engineer's decision will be final on interpretation of the Drawings and Specifications. Whenever the words "AS MAY BE DIRECTED", "SUITABLE", or "APPROVED EQUAL", or other words of similar intent and meaning are used, implying that judgment is to be exercised, it is understood that it is in reference to the judgement of the Engineer.

1.9 SUBMITTALS

A. See Specification Section 013300, SUBMITTAL PROCEDURES, for additional information and requirements.

B. Shop Drawings and Product Data

1. In addition to the provisions of Specification Section 013300, SUBMITTAL PROCEDURES, all **Shop Drawings and Product Data** shall comply with the following requirements:

a. The Contractor shall submit for review, complete sets of Shop Drawings and Product Data brochures for materials and equipment as required by each section of the Specifications.

b. All Shop Drawings and Product Data shall be submitted at one time in a neat and orderly fashion in a suitable binder with a Title Sheet including Project, Engineer and Contractor, Table of Contents, and indexed tabs dividing each group of materials or item of equipment. The Specification paragraph number for which they are proposed shall identify all items. The mark number as indicated on Drawings shall also identify all equipment and fixtures.

c. Shop Drawings and Product Data submittal shall include manufacturer's name and catalog numbers, dimensions, loads, and all other characteristics and accessories as listed in the Specifications or on the Drawings. All loads, characteristics, and accessories called for in the Specifications or on the Drawings shall be highlighted, circled or underlined on the Shop Drawings and Product Data. Descriptive literature shall be current factory brochures and submittal sheets.

d. FAX submittals are not acceptable.

e. Material or equipment shall not be ordered or installed until the Engineer processes the written review. Any item omitted from the submittal shall be provided as specified without substitution.

f. Prior to submission of the Shop Drawings and Project Data, Contractor shall review and certify that they meet the requirements of the Contract Documents.

g. A minimum period of two weeks, exclusive of transmittal time, will be required each time Shop Drawings and/or Product Data are submitted or resubmitted for review. The Contractor shall consider this time when scheduling a submittal date.

C. Submittal Review

1. Submittals will be reviewed for general conformance with the design concept, but this review does not guarantee quantity shown, nor does it supersede the responsibility of the Contractor to provide all materials, equipment and installation in accordance with the Drawings and Specifications.

2. The Contractor shall agree that Shop Drawings and Product Data submittals processed by the Engineer are not Change Orders and that the purpose of Shop Drawings and Product Data submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept. The Contractor demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.

3. It shall be clearly understood that the noting of some errors, but the overlooking of others, **does not** grant the Contractor permission to proceed in error or in conflict with Contract Documents. The Contractor shall agree that if deviations, discrepancies or conflicts between Shop Drawings and Design Drawings and Specifications are discovered either prior to or after Shop Drawing submittals are processed by the Engineer, the Design Drawings and Specifications shall control and shall be followed.

4. If a resubmittal is required, submit a complete copy of the Engineer's review letter requiring such with the resubmittal.

D. Substitutions

1. See Specification Section 012500, SUBSTITUTION PROCEDURES, for additional information and requirements.

2. In addition to the provisions of Specification Section 012500, SUBSTITUTION PROCEDURES, **Substitutions** shall comply with the following requirements:

   a. Manufacturers, model numbers and other pertinent information listed in the Specifications or on the Drawings are intended to establish minimum standards of performance, function and quality. Unless otherwise noted, the Contractor may submit equivalent compatible UL-listed equipment from other manufacturers for review, as long as the minimum standards are met.

   b. Calculations and other detailed data indicating how the item was selected shall be included for items that are not specified. Data must be complete enough to permit detailed comparison of every significant feature, function, performance, and quality characteristic that is specified, scheduled or detailed. The comparison must prove that the substituted item equals or exceeds the requirements of the specified item.

   c. The Contractor shall assume full responsibility that substituted items or procedures will meet the Specification and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items.

   d. At the Engineer's request, the Contractor shall furnish locations where equipment similar to the substituted equipment is installed and operating along with the user's phone numbers and contact person. Satisfactory

operation and service history will be considered in the acceptance or rejection of the proposed substitution.

E. Record Drawings

1. See Specification Section 017839, PROJECT RECORD DOCUMENTS, for additional information and requirements.

2. In addition to the provisions of Specification Section 017839, PROJECT RECORD DOCUMENTS, **Record Drawings** shall comply with the following requirements:

a. At the beginning of the Project, one print of each applicable Drawing will be issued to the Contractor specifically for use in preparing Record Drawings. As the work progresses, the Contractor shall maintain a record of all deviations in the work from that indicated on the Drawings. Final locations of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, e.g. building, curbs, walks. The original Drawings will be made available to the Contractor, from which he shall have made, a set of reproducible Drawings. The Contractor shall then transfer the changes, notations, etc. from the marked-up prints to the reproducible Drawings. The Record Drawings (marked-up prints and reproducibles) shall be submitted to the Engineer for review, after first securing the Inspector's verification by signature.

F. Operations and Maintenance Instructions

1. See Specification Section 017823, OPERATION AND MAINTENANCE DATA, for additional information and requirements.

2. In addition to the provisions of Specification Section 017823, OPERATION AND MAINTENANCE DATA **Operations and Maintenance Instructions** shall comply with the following requirements:

a. Three copies of Operation and Maintenance Instructions and Wiring Diagrams for all equipment shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. UPS-1). All Wiring Diagrams shall agree with reviewed Shop Drawings and indicate the exact field installation.

b. All instructions shall be submitted at the same time and shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. MCC, UPS, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included.

c. The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The Engineer's office shall be notified 48 hours prior to this meeting.

d. The Contractor shall prepare a letter indicating that all Operation and Maintenance Instructions (printed and verbal) have been given to the Owner, to the Owner's satisfaction. This letter shall be acknowledged (signed) by the Owner and submitted to the Engineer.

1.10 COORDINATION

A. See Specification Section 013113, PROJECT MANAGEMENT AND COORDINATION, for additional information and requirements.

B. Electrical Drawings are essentially diagrammatic, unless specifically dimensioned. Some work may be shown offset for clarity. The actual locations of all materials, conduits, fixtures, supports, etc. shall be carefully planned prior to installation of any work in order to avoid all interferences with each other, or with architectural, civil, mechanical, plumbing, structural or other elements.

C. While the size and location of equipment are shown to scale wherever possible, all dimensions and conduit/conductor data shall be verified in the field.

D. Where the work requires connections to be made to equipment furnished and set in place by others, the Contractor shall obtain exact rough-in dimensions from the manufacturer of such equipment and he shall install the connections in a neat and workmanlike manner.

E. If discrepancies are discovered between Drawings and Specifications requirements, the more stringent requirement shall apply.

F. All conflicts shall be called to the attention of the Architect and the Engineer prior to the installation of any work or the ordering of any equipment.

G. No work shall be prefabricated or installed prior to this coordination. No additional compensation will be considered to the Contractor for any prefabrication or installation performed prior to this coordination.

1.11 SCHEDULING

A. All work shall be scheduled subject to the review of the Architect, Engineer and the Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work for which contracted, as rapidly as possible consistent with good work, and shall cause no delay to other Contractors engaged upon this project or to the Owner.

1.12 WARRANTY

A. See Specification Section 017836, WARRANTIES, for additional information and requirements.

B. Guarantee shall be in accordance with the General Conditions. These Specifications may extend the period of the guarantee for certain items. Where such extension are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the Certificate of Guarantee shall be furnished to the Owner through the Engineer.

C. Contractor shall deliver to the Owner a written guarantee on all workmanship, materials and equipment for a period of one (1) year from the date of acceptance by the Owner. Any work found to be faulty during that period of time shall be corrected at once, upon written notification, at the expense of the Contractor. This shall include repair or replacement of the premises that may be damaged as a result of faulty work and materials furnished.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new unless otherwise noted.

B. Materials and equipment of a given type shall be by the same manufacturer.

C. Materials and equipment shall be covered or otherwise protected during construction as required to maintain the material and equipment in new factory condition until project acceptance. Upon completion of work and prior to final inspection, Contractor shall thoroughly clean all exposed fixtures, trim and equipment, and shall leave the entire installation in neat, clean, and useable condition. Materials and equipment shall be free of dents, scratches, marks, shipping tags, and all defacing features at time of project acceptance.

D. The Contractor shall order materials and equipment in a timely manner to prevent any delay in the construction schedule, and he shall bear any penalty by vendors to meet schedules.

E. Verify all dimensional information to ensure proper clearance for installation of equipment. Check all materials and equipment after arrival on the jobsite and verify compliance with the Contract Documents.

PART 3 - EXECUTION

3.1 DEMOLITION

A. The Contractor shall protect existing electrical equipment and installations that are not indicated to be removed. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Exposed electrical equipment and installations, indicated to be demolished, shall be removed in their entirety.

C. Buried raceway and wiring, indicated to be abandoned in place, shall be cut 2 inches below the surface of adjacent construction and removed in its entirety. Raceways abandoned in place shall be capped and disturbed surfaces shall be patched to match existing finish.

D. Demolished material shall be removed from Project site.

E. Components indicated for relocation shall be removed, stored, cleaned, reinstalled, reconnected, and made operational.

3.2 CUTTING AND PATCHING

A. The Contractor shall perform all cutting and drilling, or other work, required to provide openings in walls, ceilings, floors, footings, foundations or other structures necessary to accomplish work under this Specification Division. The cutting shall be performed by skilled mechanics of the trades involved.

B. Cutting or coring shall not impair the strength of the structure. Any damage resulting from this work shall be repaired at the Contractor's expense to the satisfaction of the Architect.

C. Wherever possible, work shall be done in a concealed and neat workmanlike manner requiring the least amount of cutting of studs, plates and woodwork. Such cutting or notching is allowed only after consultation with and by permission of the Engineer.

D. The Contractor shall repair and refinish disturbed finish materials and other surfaces to accurately match adjacent undisturbed new or existing structures and surfaces and shall install new fireproofing where existing fire-stopping has been disturbed. The repair and refinishing of materials and other surfaces shall be by skilled mechanics of the trades involved.

E. All cuts are to be clean with no chipping. Where chipping occurs as a result of work in a cut area, a new clean cut shall be made immediately prior to patching.

3.3 EXCAVATION AND BACKFILL

A. The Contractor shall provide excavation and backfilling required to complete work detailed in the Drawings and Specifications. Unless otherwise noted, minimum earth cover above top of conduit outside building walls shall be 24", not including base and paving in paved areas.

B. The location of all underground facilities shall be verified with the Owner and utility companies prior to the commencement of any excavation.

C. The Contractor shall contact Underground Service Alert (USA), at 1-800-642-2444, ten (10) days prior to doing any excavation or trenching, and shall advise USA of the work schedule and comply with their requirements.

D. The Contractor shall notify the Owner 72 hours prior to any excavation.

E. Provide all shoring required by site conditions. Where over-excavation occurs, provide compacted sand backfill. Where groundwater is encountered, remove to keep excavation dry, using well points and pumps as required.

F. The conduit shall be laid on firm soil cut true and even to afford bearing for the full length of the barrel of the conduit.

G. When the bottom uncovered at sub-grade is soft and, in the opinion of the Engineer, cannot support the conduit, a further depth shall be excavated and refilled to conduit foundation grade as required by the Engineer.

H. Backfill (where concrete encasement is not required):

1. Material 3” below, 3” around, and to 6” above conduit shall be sand. Place carefully around and on top of conduit, taking care not to disturb conduit. Consolidate with vibrator.

2. Material from 6” Above Conduit to Grade shall be sandy or silty loam, free of lumps, laid in 6” layers, uniformly mixed to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6” layers may be used, subject to review by Engineer.

I. No excavation below the level of, or adjacent to, foundations of footings shall be made except in a manner approved by the Structural Engineer.

J. Compaction

1. Prior to compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Under **Structures, Building Slabs, Walkways, and Steps**, compact top 6” of sub-grade and each layer of backfill or fill material at 92% maximum relative compaction. Compact upper 2’ of backfill in utility trenches or other excavations to 92% minimum relative compaction.

3. In **Lawns and Unpaved Areas**, compact top 6” of sub-grade material to 85% relative compaction.

4. Under **Pavement**, compact top 8” of sub-grade immediately beneath the base course at 95% minimum relative compaction.

3.4 CONCRETE EQUIPMENT BASES

A. The Contractor shall provide a concrete equipment base for each piece of electrical equipment required to have a base as shown in the Drawings, Notes and Details.

B. Concrete equipment bases shall be 6” high concrete, 3500PSI strength, unless otherwise noted. Base shall extend 6” beyond the largest dimensions of the equipment, unless otherwise noted. The top edge of the base shall have a ¾” chamfer. The base shall have #4 reinforcing bars at 12” on center, each way, located at the mid-depth of the base.

C. If the base is not poured at the same time as the floor slab with base rebar tied to floor rebar, the base shall be anchored to the floor slab per the following criteria:

1. Drill 1” diameter, 4” deep hole in floor.

2. Fill hole with **Simpson SET Epoxy** then insert 8” long, #4 rebar into hole. Tie this rebar to that required for the equipment base.

3. Provide a minimum of 4 of these anchors per base but no more than 4 feet apart in either direction.

4. Anchor points shall be 12” from the edge of the base.

D. Concrete anchors shall be steel bolts with expansion anchors requiring a drilled hole. Powder-driven anchors are not acceptable. Minimum concrete embedment shall be 4.5 diameters but not less than manufacturer’s requirements for minimum strength. Minimum spacing shall be 10 diameters center-to-center and 5 diameters center to edge of concrete but not less than manufacturer’s requirements for minimum strength. Maximum allowable stresses for tension and shear shall be 80% of the ICC-ES test report values.

E. Where applicable, concrete structures shall be submitted to the serving utility for their approval prior to installation.

F. Concrete bases for pole mounted lighting fixtures shall be 3500PSI strength, unless otherwise noted, and shall have vertical reinforcing bars with horizontal reinforcing bar ties as detailed on the drawings. The top edge of the concrete base shall have a 1” chamfer.

3.5 SEISMIC ANCHORAGE AND BRACING

A. Equipment Anchorage

1. All electrical equipment and components shall be anchored and installed per the details on the approved construction documents. Where no detail is indicated, the following components shall be anchored or braced to meet the force and displacements requirements prescribed in the 2022 CBC, Sections 1617A.1.18 through 1617A.1.26. and ASCE 7-16 Chapter 13, 26, and 30:

   a. All permanent equipment and components

   b. Temporary or movable equipment that is permanently attached (e.g. hard wired) to building utility electrical service.

   c. Movable equipment which is stationed in one place for more than 8 hours and heavier than 400 pounds are required to be anchored with temporary attachments.

2. The attachment of the following electrical components shall be positively attached to the structure, but need not be detailed on the plans. These components shall have flexible connections provided between the components and associated conduit.

   a. Components weighting less than 400 pounds and have a center of mass located 4 feet or less above the adjacent floor or roof level that directly support the components.

b. Components weighting less than 20 pounds, or in the case of distributed systems, less than 5 pounds per foot, which are suspended from a roof or floor or hung from a wall.

1) For those elements that do not require details on the approved drawings, the installation shall be subject to the approval of the Structural Engineer of Record and the DSA Structural Engineer. The project inspector will verify that all components and equipment have been anchored in accordance with above requirements.

B. Electrical Distribution System Bracing

1. Electrical distribution systems shall be braced to comply with the forces and displacements prescribed in ASCE 7-16 Section 13.3 as defined in ASCE 7-16 Section 13.6.7, 13.6.6, 13.6.5, and 2022 CBC, Sections 1617A.1.23, 1617A.1.24, 1617A.1.25, and 1617A.1.26.

2. The bracing and attachments to the structure shall be detailed on the approved drawings or they shall comply with one of the OSHPD Pre-Approvals (OPM#) as modified to satisfy anchorage requirements of ACI 318, Chapter 17.

3. Copies of the manual shall be available on the jobsite prior to the start of hanging and bracing of the electrical distribution systems.

4. The Structural Engineer of Record shall verify the adequacy of the structure to support the hanger and brace loads.

3.6 CLEANING AND PROTECTION

A. The Contractor shall, progressively and at completion of the job, thoroughly clean all of his work including outlets, fittings, and devices, and inspect exposed finishes. The Contractor shall remove all burrs, dirt, grease, paint spots, stains, labels, tags, rust, foreign material, and construction debris resulting from his work.

B. The Contractor shall protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 260100

SECTION 260500
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. See Section 260000

1.3 STANDARDS

A. NEMA 250 Standard for Enclosures for Electrical Equipment (1000 Volts Maximum)

PART 2 - PRODUCTS

2.1 CONCRETE PADS, PULL BOXES AND MANHOLES

A. At the Contractor's option, he shall provide cast-in-place or pre-cast structures.

B. Concrete Forms and Reinforcement Materials shall be as specified in Division 03 Section "Cast-in-Place Concrete".

C. Concrete shall be 3500-psi, 28-day compressive strength as specified in Division 03 Section "Cast-in-Place concrete".

D. Weatherproof concrete pull boxes, junction boxes and telephone boxes shall be manufactured by Christy Concrete Products or equal. All boxes shall have lids marked "Power", "Signal", "Fiber Optic", "Danger-High Voltage", etc. and be traffic-rated per CalTrans drawing ES-8 minimum where pull box occurs in vehicular traffic areas.

2.2 RACEWAYS AND FITTINGS

A. Galvanized rigid steel conduit (GRC) shall meet ANSI C80.1, and be heavy wall, hot dipped galvanized inside and out, with threaded ends, for use with threaded type fittings.

B. Galvanized intermediate metallic conduit (IMC) shall meet ANSI C80.6, be zinc-coated steel and have threaded fittings.

C. Galvanized electrical metallic tubing (EMT) shall meet ANSI C80.3, and be continuous, seamless steel tubing, galvanized or sherardized on exterior, coated on interior with smooth hard finish of lacquer, varnish or enamel, with steel set-screw, steel compression or die-cast compression type fittings. Provide concrete-tight type compression fittings where required and rain-tight wet location listed compression fittings for outdoor locations.

D. Rigid non-metallic conduit (RNC) shall meet NEMA TC 2, be Schedule 40 PVC, suitable for 90°C, with solvent cemented type NEMA TC3 fittings.

E. Flexible metallic conduit (FMC) shall be single strip, continuous, flexible interlocked double-wrapped steel, hot dip galvanized inside and out forming smooth internal wiring channel, with steel, compression type fittings.

F. Liquid-tight flexible metallic conduit (LFMC) shall be same as FMC except with inert sunlight-resistant, mineral-oil-resistant watertight plastic outer jacket. Fittings shall be cast malleable iron body and gland nut, cadmium plated with one-piece brass grounding bushings threaded to interior of conduit. Spiral molded vinyl-sealing ring between gland nut and bushing and nylon-insulated throat.

G. All raceway fittings shall be specifically designed for the raceway type with which used.

2.3 SURFACE MOUNTED RACEWAY

A. Surface Mounted **Nonmetallic** Raceways and system components shall be composed of U.L. Listed materials and exhibit nonflammable self-extinguishing characteristics. Larger (2 and 3 channel non-metallic raceways) shall be UL Listed under File Nos. E90378 Guide RJTX and E90377 Guide RJYT, respectively. Raceways shall be tested to UL94V-0, or equivalent.

B. Surface Mounted **Nonmetallic** Raceway shall be a two-piece design with a base and snap-on cover(s). The raceway base shall accept either a single cover that spans the entire base or two individual covers which together cover the base and allow independent access to services.

C. Surface Mounted **Nonmetallic** Raceway shall be available with two or three wiring channels separated by integral barriers. One channel must be large enough to accept standard power and communication devices without restricting capacity of the adjacent channel. The raceway base and cover shall be manufactured of rigid PVC compound, available in ivory or white.

D. Device brackets shall be available for mounting standard devices in-line or offset from the raceway. A device bracket shall provide up to three single-gang openings at one location. Faceplates shall match raceway and fit flush in the device plate. They shall be manufactured of rigid PVC compound.

E. The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP, STP (150 ohm), fiber optic, coaxial and other cabling types with faceplates and bezels to facilitate mounting. A complete line of preprinted station and port identification labels, snap-in icon buttons, as well as write-on station identification labels shall be available.

F. A complete line of full capacity corner elbows and tee fittings must be available to maintain a controlled 2" cable bend radius which meets the specifications for Fiber Optic and UTP/STP cabling and exceeds the TIA / EIA 569-A requirements for communications pathways. They shall be manufactured of a rigid PVC compound.

G. A full complement of fittings must be available including, but not limited to tees, entrance fittings, cover clips, and end caps. They shall be manufactured of a rigid PVC compound. The fittings shall have a matte texture, in ivory or white colors to match the base and cover. They shall overlap the cover and base to hide uneven cuts. All fittings shall be supplied with a base where applicable to eliminate mitering. Transition fittings shall be available to adapt to other raceways.

H. Surface Mounted **Nonmetallic** Raceway shall be multi-channel 5400 Series by the Wiremold Company, or equal.

2.4 METAL CLAD CABLE (TYPE MC-PCS)

A. Type MC-PCS Cable shall consist of 3 or more individually insulated 600V THHN/THWN copper conductors not less than #12 AWG + 2 additional insulated 600V THHN/THWN #16 AWG copper conductors separately contained within a PVC jacket. All conductors shall be contained within an overall polypropylene cable assembly tape and an outer galvanized steel or aluminum interlocked armor.

B. Type MC-PCS Cable shall have as one of its conductors a separate full sized equipment grounding conductor as the armor is not considered an equipment grounding means.

C. Type MC-PCS Cable fittings shall be of the single screw clamp variety with steel or cast malleable iron bodies and threaded male hubs with insulated throats. Fittings shall be UL listed for use with MC cable type specified.

2.5 MODULAR WIRING SYSTEM

A. Modular wiring system shall consist of factory pre-assembled connectors and pre-wired cable assemblies to interface with lighting fixtures and lighting switches.

2.6 CONDUCTORS

A. All conductors shall be delivered to the site in their original unbroken packages, plainly marked or tagged with UL labels, size, type of wire, type of insulation, name of the manufacturing company and trade name of the wire.

B. All conductors shall be minimum of 98% conductivity soft drawn copper. Conductors #8 AWG and larger shall be stranded type “THHN/THWN”, 600 Volt insulation. Conductors #10 AWG and smaller shall be solid copper “THHN/THWN”, 600 Volt insulation.

C. Insulation shall be Thermoplastic Type rated at 75 degrees C. minimum.

2.7 PULL BOXES AND WIREWAYS

A. Pullboxes and Enclosures for outdoor use shall be NEMA 250, Type 3R or Type 4, unless otherwise noted.

B. Pullboxes and Enclosures for indoor use shall be NEMA 250, Type 1, unless otherwise noted.

C. Wireways shall be constructed in accordance with UL 870 for wireways, auxiliary gutters and associated fittings. Every component including lengths, connectors and fittings shall be UL Listed.

D. Wireways and auxiliary gutters shall have continuous removable cover secured with screws and keyhole slots. Hinged cover shall be provided where installed above suspended ceiling.

E. Fabricated sheet steel pull boxes shall be installed only in dry, protected locations and shall be furnished with knockouts and removable screw cover. Box shall be finished with one coat of zinc chromate and a coat of primer sealer and where exposed to public view shall be painted to match the surrounding surface.

F. Weatherproof sheet steel pull boxes shall be fabricated of code gauge galvanized sheet steel with two coats of rust resistant finish and shall be furnished with gasket and made completely weathertight.

2.8 WIRING DEVICES AND MATERIALS

A. Outlet Boxes shall meet NEMA OS1 and be galvanized code gauge steel. Boxes in masonry shall be square cornered. Boxes exposed to weather or in wet locations shall be Type FD cast metal with external threaded hubs and gasketed cover and shall meet NEMA FB1.

B. Outlet box extensions shall be U.L. listed and shall be attached to box with threaded metal screws. “Flash Guards” are not permitted to be used as box extensions.

C. Approved manufacturers of metal boxes are Circle AW, Crouse-Hinds, Steel City or equal.

D. Floor Boxes and Fittings

1. Poke through type shall be Raceway Components, Inc. or Walker.

2. Recessed flush floor box type shall be Steel City or Walker. Floor boxes installed in a concrete slab on grade shall be provided with a concrete pour pan.

E. A/C Snap Switches:

1. 120/277 Volt Switches shall be quiet, fast make, fast break design, toggle handle, with totally enclosed case, rated 20 ampere, heavy duty specification grade. Provide matching two pole, 3-way, 4-way, and key switches as required.

2. A/C snap switches served by emergency power circuits shall be red.

3. A/C snap switches shall be Hubbell or Leviton 1221 series.

F. Receptacles:

1. Duplex Receptacles:

a. Duplex Receptacles shall be tamper-resistant, full gang size, polarized duplex, parallel blade, U-grounding slot, specification grade, rated at 20 amperes, 125 volts and designed for split feed service.

b. Receptacles served by normal power circuits shall be ivory, grey, white or brown, dependent upon room wall finish and as direct by Architect. Receptacles served by emergency power circuits shall be red.

c. Duplex receptacles shall be Hubbell HBL5362WTR series, or equivalent.

2. GFCI Receptacles:

a. GFCI receptacles shall be weather-resistant, tamper-resistant, duplex, feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Units shall be designed for installation in a 2-3/4-inch deep outlet box without an adapter.

b. Duplex GFCI receptacles shall be Hubbell #GFTWRST20W series, or equivalent to match regular duplex receptacles.

3. TVSS Receptacles:

a. TVSS Receptacles shall be Decora Plus duplex, straight blade, industrial grade, self-grounding, surge protected with indicator light, rated at 20 amperes, 125-volts.

b. TVSS Receptacles shall have integral TVSS with line-to-ground, line-to-neutral, and neutral-to-ground surge protection, with a nominal clamp level

rating of 500 volts and minimum single transient pulse energy dissipation of 140 J line to neutral, and 70 J line to ground and neutral to ground.

c. TVSS Receptacles shall be Hubbell HBL5362WSA series, or equivalent.

4. Required California Energy Code Controlled Receptacles: Provide one controlled duplex receptacle within 6-feet of each uncontrolled receptacle in all private offices, open office areas, reception lobbies, conference rooms, kitchenettes in office spaces and copy rooms as required by 2022 California Energy Code Section 130.5(d). Controlled receptacles shall be permanently factory marked with the symbol shown in 2022 CEC Figure 406.3(E) and the word “controlled”. Adhesive labels shall not be permitted in lieu of permanent factory marking. Controlled receptacles shall be tamper-resistant Hubbell HBL5362C2WHITR series or equivalent.

5. Required Weather-Resistant Receptacles: All 15- and 20-ampere, 125- and 250-volt non-locking type receptacles located outdoors and in damp and wet locations shall be listed weather-resistant type.

6. Required Tamper-Resistant Receptacles: Tamper resistant receptacles shall be provided in the following areas where required by CEC 406.12:

   a. Dwelling units;

   b. Guest rooms and guest suites;

   c. Child care facilities;

   d. Preschool and elementary school education facilities;

   e. Business offices, corridors, waiting rooms and the like in clinics, medical and dental offices and outpatient facilities;

   f. Subset of assembly occupancies described in CEC 518.2 to include places of waiting transportation, gymnasiums, skating rinks and auditoriums;

   g. Dormitories;

7. Receptacles for Owner-furnished equipment shall match that equipment’s plug configuration.

8. Other Receptacles: Other receptacles shall match the plug configuration and ratings required for the utilization equipment that is served.

G. Plugstrip

1. Plugstrip shall be Wiremold.

H. Device cover plates shall be provided and installed at all wiring devices, switches, outlets, and similar applications, and shall be as directed by architect. Pull boxes and junction boxes to which no fixture is to be attached shall be fitted with blank cover plates painted to match surrounding. All cover plates installed on rated walls shall be brushed stainless steel. Cover plates for receptacles in wet locations shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted and

shall be identified as “extra-duty”. Cover plates installed at switches used for lighting control in all multiple occupant restrooms, all hallways and corridors, and in other locations where lockable cover plates are indicated on the Drawings shall be the dustproof locking stainless steel cover Legrand model WP26-L.

2.9 TERMINAL CABINETS AND CLOSETS

A. Cabinets and fronts shall be in accordance with NEMA Standard Publication No. PB1-1971 and UL Standards No. 67. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring loaded door pulls. The flush lock shall not protrude beyond the front of the door. All locks shall be keyed like the panel board locks. Fronts shall have adjustable indicating trim clamps that shall be completely concealed when the doors are closed. Doors shall be mounted by completely concealed steel hinges. Fronts shall not be removable with the door in the locked position. A frame and card with a clear plastic covering shall be provided on the inside of the door. Fronts shall be of code gauge full finished steel with rust inhibiting primer and baked enamel finish.

2.10 PANELBOARDS

A. Furnish panelboards shown on plans and described herein. All cans shall be a minimum of 20” wide and 5.75” deep unless otherwise shown. They shall be totally flat or equal with flush keyed locks.

B. Fronts shall be cold rolled sheet steel painted with ANSI 61 gray enamel over a rust inhibitor. They shall be equipped with door, flush hinges, and flush proper cylinder tumbler lock, metal circuit card holder, and quarter turn adjustable trim clamps. Panel locks shall be keyed alike.

C. Panel shall consist of reinforced corrosion resistant galvanized sheet steel frame with silver plated copper bus bars and circuit breakers properly supported to prevent vibration breakage in handling. All terminals shall be solderless type suitable for specified conductors of size indicated.

D. Neutral bus shall be full size. Neutral bus shall be 200% rated when supplied from a double neutral feeder. Provide an equipment ground bus in each panelboard. In addition to the equipment ground bus, provide an isolated ground bus when supplied from a feeder which includes an isolated grounding conductor.

E. Branch circuit breakers shall be molded case, bolt-on, and fully interchangeable without disturbing adjacent units. All 2-pole and 3-pole breakers shall have common trips.

F. Branch panelboards and overcurrent protection devices shall have a minimum short circuit rating of 10,000 RMS symmetrical AIC (120/208V).

G. Distribution panelboards and overcurrent protection devices shall have a minimum short circuit rating of 42,000 RMS symmetrical AIC (120/208V).

H. All Panelboards shall be fully rated as shown on Drawings; series-rating shall not be allowed.

I. Panelboards shall bear an Arc-Flash Hazard Warning label in accordance with CEC Article 110.16.

J. Breakers for switching lights shall be type SWD, rated for switching duty. Breakers for mechanical equipment shall be HACR type.

K. All spaces shall have hardware.

2.11 DISCONNECTING DEVICES

A. Disconnecting devices shall be provided as shown and/or as required by CEC.

B. Motor-rated switches shall be toggle-type, quick make-quick break, rated 2 HP, 250 VAC, with number of poles as required. They shall be equipped with overload heaters rated for overload protection of loads controlled.

C. Motor-rated switches shall be flush-mounted adjacent to load controlled. Where flush mounting is not possible, switches shall be surface mounted in NEMA enclosure suitable for environment in which installed.

D. Disconnect switches shall be 250V or 600V class, rated heavy-duty, horsepower rated, quick-make, quick-break, dead-front type and provided with proper number of poles.

E. Disconnect Switches shall be self contained in a NEMA 1 gasketed enclosure (NEMA 3R where installed outdoors) and externally operable from the front.

F. Fusible disconnect switches shall be equipped with rejection type clips suitable for UL Class R fuses up to 600A and suitable for UL Class L fuses above 600A. Fuse interrupting rating shall be 200,000 RMS symmetrical amperes.

G. Circuit breakers utilized as disconnecting devices shall comply with the requirements stated in other articles of this section and CEC.

2.12 FUSES

A. Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Bussman
2. Gould Shawmut

3. Littlefuse.

B. Fuses 600 amperes and below shall be UL Class RK1, 200,000 RMS symmetrical amperes interrupting rating.

C. Fuses 601 amperes through 4000 amperes shall be UL Class L, 200,000 RMS symmetrical amperes interrupting rating.

2.13 MAGNETIC STARTERS FOR MECHANICAL EQUIPMENT

A. All magnetic starters for mechanical equipment shall be furnished with integral 120VAC control transformers, sized to handle the starter and all controls connected to it – pilots, EP valves, etc.

B. All magnetic starters for mechanical equipment shall be provided with auxiliary contacts as required for interlock to EMS System. An allowance of at least one auxiliary contact per starter shall be estimated.

2.14 SUPPORTING DEVICES

A. Supporting devices shall be constructed of cold-formed steel, with a corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal items for use outdoors or in damp locations shall be hot-dipped galvanized steel.

C. Slotted-steel channel supports shall have flanged edges turned toward the web, and 9/16-inch diameter slotted holes at a maximum of 2 inches on center, in the web.

1. Channel thickness shall be selected to suit structural loading.

2. Fittings and accessories shall be products of the same manufacturer as the channel supports.

D. Raceway and cable supports shall be manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe sleeves shall be ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, with plain ends.

F. Cable supports for vertical conduit shall be a factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs shall have number and size of conductor gripping holes as required to suit individual risers. Body shall be constructed of malleable-iron casting with hot-dip galvanized finish.

G. Concrete anchors shall be steel bolts with expansion anchors requiring a drilled hole. Powder driven anchors are not acceptable.

H. Toggle bolts shall be all-steel springhead type.

2.15 ELECTRICAL IDENTIFICATION

A. Identification devices shall be a single type of product for each application category. Colors shall be as prescribed by ANSI A13.1, CEC, and these Specifications.

B. Raceway and cable labels shall comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.

1. Pre-tensioned, wraparound plastic sleeves shall be a flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the item it identifies.

2. Preprinted, flexible, self-adhesive, vinyl labels shall have a legend, over-laminated with a clear, weather- and chemical-resistant coating.

3. Color shall be black letters on orange background.

4. Legend shall indicate voltage.

C. Self-adhesive colored marking tape for raceways, wires and cables shall be vinyl tape, not less than 1 inch wide by 3 mils thick.

D. Underground Warning Tape shall be vinyl tape, compounded for permanent direct-burial service, not less than 6 inches wide by 4 mils thick, embedded with a continuous metallic strip or core, brightly-colored, continuously-printed with a legend that indicates the type of underground line.

E. Tape markers for wire shall be vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

F. Color-coding cable ties shall be made of Type 6/6 nylon, be self-locking type and of colors to suit coding scheme.

G. Engraved plastic labels, signs and instruction plates shall be made from black (or red as noted) Bakelite laminate engraving stock with a white core, punched or drilled for mechanical fasteners. It shall have a minimum thickness of 1/16-inch for signs up to 20 sq. in. and a minimum thickness of 1/8-inch for larger sizes.

H. Interior Warning and Caution signs shall comply with 29 CFR, Chapter XVII, Part 1910.145 and shall be preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.

I. Exterior Warning and Caution signs shall comply with 29 CFR, Chapter XVII, Part 1910.145 and shall be weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch, galvanized-steel backing, with colors, legend, and size appropriate to the application. They shall be equipped with 1/4-inch grommets in each corner for mounting.

J. Fasteners for nameplates and signs shall be self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

K. Arc-Flash Hazard Warning labels shall be provided at electrical equipment such as switchboards and panelboards in accordance with CEC 110.16.

L. Circuit Identification – A typewritten circuit directory shall be provided at each panelboard and switchboard in accordance with CEC Article 408.4(A). The Contractor shall develop and prepare the circuit identification description based on the as-built condition.

M. Source of Supply Identification – All switchboards, panelboards and transformers shall have a typewritten label applied indicating the device or equipment where the power supply originates per CEC Article 408.4(B).

2.16 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-transformer cabinets shall comply with requirements of the governing electrical power utility company.

B. Meter sockets shall comply with requirements of the governing electrical power utility company.

C. Modular meter centers shall be a factory-coordinated assembly of a main meter center circuit-breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections, complete with interconnecting buses.

1. The housing shall be a NEMA 250, [**Type 1**] [**Type 3R**] enclosure.

2. Tenant Branch Circuit Breakers: Series combination rated to protect circuit breakers in downstream panelboards that have 10,000-A interrupting capacity, minimum.

2.17 EQUIPMENT FOR ELECTRICITY METERING BY OWNER

A. Meter shall be an electronic kilowatt-hour measuring type to record electricity used.

1. Kilowatt-hour display shall be digital liquid crystal.

2. Enclosure shall be a NEMA 250, [Type 1] [Type 3R] , minimum, with hasp for padlocking or sealing.

3. Memory backup shall be self-contained to maintain memory throughout power outages of 72 hours, minimum.

4. Sensors shall be [**Split**] [**Solid**] core, current-sensing type, with current or voltage output, selected for optimum range and accuracy for the ratings of the circuits indicated for this application.

5. Nationally recognized testing laboratory shall certify meter accuracy meets [**ANSI C12.1**] [**ANSI C12.16**] specifications.

B. Meter shall be an electronic kilowatt-hour/demand measuring type to record electricity used and highest peak demand over a time period. Meter shall be designed for use on the type and rating of circuit indicated for its application.

1. Kilowatt-hour display shall be digital liquid crystal.

2. Kilowatt-demand display shall be a digital, liquid-crystal type to register highest peak demand.

3. Enclosure shall be a NEMA 250, [Type 1] [Type 3R], minimum, with hasp for padlocking or sealing.

4. Memory backup shall be self-contained to maintain memory throughout power outages of 72 hours, minimum.

5. Sensors shall be [**Split**] [**Solid**] core, current-sensing type, with current or voltage output, selected for optimum range and accuracy for the ratings of the circuits indicated for this application.

6. Nationally recognized testing laboratory shall certify meter accuracy meets [**ANSI C12.1**] [**ANSI C12.16**] specifications.

7. Demand Signal Communication Interface shall match signal to building automation system input that conveys data on instantaneous/integrated demand level measured by meter used for load switching to control demand.

C. Current-transformer cabinets shall be listed or recommended by metering equipment manufacturer for use with sensors indicated.

D. Subject to compliance with requirements, provide products by one of the following metering equipment manufacturers:

1. E-MON Corporation.

2. National Meter Industries, Inc.

3. Osaki Meter Sales, Inc.

2.18 TOUCHUP PAINT

A. Touch-up paint shall be equipment manufacturer's paint selected to match installed equipment finish.

B. Touch-up paint on galvanized surfaces shall be zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL INSTALLATION

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site throughout the construction of the project.

B. The layout and installation of electrical work shall be coordinated with the overall construction schedule to prevent delay in completion of the project.

C. Dimensions and information regarding accurate locations of equipment and structural limitations and finish shall be verified with other sections.

D. The drawings do not show all raceway, wiring, offsets, bends, special fittings, junction or pull boxes necessary to meet job conditions. Items not shown as indicated, where are clearly necessary for proper operation or installation of systems shown, shall be provided as required, at no increase in contract price.

E. Materials and Components shall be installed level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

F. Electrical equipment, outlets, junctions and pull boxes shall be installed in accessible locations, avoiding obstructions, preserving maximum headroom, and keeping openings and passageways clear.

G. Equipment shall be installed to facilitate service, maintenance, and repair or replacement of components. It shall be connected for ease of disconnecting, with minimum interference with other installations. Minor adjustments in the locations of equipment shall be made where necessary providing such adjustments do not adversely affect function of the equipment. Major adjustments for the location of equipment shall be previously approved and detailed on the Record Drawings.

H. Right of Way shall be given to raceways and piping systems installed at a required slope.

3.2 PRECAST CONCRETE PULL BOXES AND MANHOLES

A. Contractor shall provide a minimum of 3-6" of sand base material suitable to receive the pullbox or manhole. The base material shall be compacted and graded level at proper elevation to receive the pullbox or manhole in relation to the conduit grade or ground cover requirements as designated in the plans.

B. Sealants used between the joints of the pullbox or manhole are at the Contractor's discretion unless otherwise specified. If grout is used, it should consist of two parts plaster sand to one part cement with sufficient water added to make the grout flow under its own weight. The grout should be poured into a water soaked groove and filled to the top of the groove unless a double amount is to be used as a further precaution against leakage. In this case, the mastic sealant should be placed on the two shoulders of the groove. The next section of pullbox or manhole should be placed while the foaming action is in process. Contractor shall verify grades with the Engineer and shall set holes and boxes level at proper grades.

C. All conduits penetrating the pull box or manhole shall have seals to prevent water from entering the raceway.

3.3 RACEWAY APPLICATION

A. Wiremold 5500 Series three-channel surface non-metallic raceway shall be used within corridors to distribute data and low voltage system signals throughout the building.

B. Wiremold 5400 Series two-channel surface non-metallic raceways shall be used within classrooms to distribute power and data to plug outlets and data receptacles.

C. Wiremold 800 Series wiremold surface non-metallic raceway shall be used within classrooms to extend circuiting for the fire alarm system from the two-channel surface non-metallic raceway to the location of the notification appliance.

D. Wiremold 5000 Series surface non-metallic raceway shall be used for horizontal runs @ 18" A.F.F. within offices to distribute power and data to plug outlets and data receptacles.

E. A complete system of surface non-metallic raceways including all fittings and covers shall be installed as required to continuously route raceways around corners, transition between and route down walls, and provide all device terminations. Retaining clips shall be installed such that wiring and cabling shall be retained within the raceway when the cover is removed. All raceway fittings shall be specifically designed for the raceway type with which used. Raceways shall be listed by Underwriters Laboratories Inc.

F. Galvanized Rigid Steel Conduit (GRC) **may** be used in all locations. Where installed in direct contact with earth, conduit shall be wrapped with two layers of half-lapped 10-mil PVC tape for a total thickness of 40-mil or have a factory applied 40-mil PVC coating.

G. Galvanized Rigid Steel Conduit (GRC) **shall** be used where exposed to physical damage, indoors where exposed to moisture, in exposed outdoor installations, in systems higher than 600 volts, and where required by code.

H. Galvanized Intermediate Metallic Conduit (IMC) **may** be used in indoor locations not in direct contact with earth.

I. Galvanized Electrical Metallic Tubing (EMT) may be used in dry indoor locations according to the following criteria:

1. It is not subject to physical damage.

2. It is not in direct contact with earth.

3. It is not in concrete slabs.

4. It is not in a hazardous area.

J. Rigid Non-Metallic Conduit (RNC) Schedule 40 PVC **may** be used underground or below concrete slabs on grade. Rigid Non-Metallic Conduit (RNC) Schedule 80 PVC **may** be used to pass through concrete slabs. Rigid Non-Metallic Conduit (RNC) **may** be used in compliance with utility company requirements for utility service conduits. Rigid Non-Metallic Conduit (RNC) **shall not** be installed above grade or above finished floor level.

K. Liquid-tight Flexible Metallic Conduit (LFMC) **may** be used in all locations to make final connections to motors, transformers, or other mechanical equipment (not to exceed 24 inches in length) or lighting fixtures (not to exceed 72 inches in length). Where specifically approved by the Engineer, LFMC may be used to facilitate wiring in tight locations or in other conditions that make the use of other conduit impracticable.

L. Flexible Metallic Conduit (FMC) **may** be used in dry locations to make final connections to motors, transformers, or other mechanical equipment (not to exceed 24 inches in length) or lighting fixtures (not to exceed 72 inches in length). Where specifically approved by the Engineer, FMC may be used to facilitate wiring in tight locations or in other conditions that make the use of other conduit impracticable.

3.4 RACEWAY INSTALLATION

A. General

1. Expansion joints shall be provided at building expansion joints or as required due to length of run or difference in temperatures.

2. All fittings that are exposed or in damp areas shall have sealing glands and proper gasket.

3. In general, all conduits shall be sloping to drain. Bends that place a trap in a conduit shall be avoided. Provided drip fitting as required. Dux-Seal high ends of all underground raceways.

4. All conduit runs shall be mechanically and electrically continuous from outlet to outlet. Conduit size or type shall not be changed between outlets.

5. All empty raceways shall be equipped with pull lines, capped and labeled. Pull lines shall be 3/16” polypropylene, No. 14 AWG zinc-coated steel or

monofilament plastic line with not less than 200-lb tensile strength. Leave at least 24 inches of slack with identification tag at each end of the pull wire.

6. Minimum size of any conduit for lighting, power and signal shall be ¾" conduit unless shown otherwise.

7. Use temporary raceway caps to prevent foreign matter from entering. Immediately prior to installation of conductors, conduit shall be blown and swept free of foreign materials. All conduit stubs for future, both above and below grade, shall be capped. Run conduits for spare panelboard circuits to attic or accessible spaces.

8. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

9. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

10. There shall be no more than the equivalent of four quarter bends (360-degrees total) between pull points such as pull boxes, outlet boxes or conduit bodies, in one run of conduit.

11. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

12. Conduits shall be securely fastened to building structure at intervals not greater than ten feet.

13. Conduit shall be square cut and reamed if required to full size, with thread full cut and true.

14. Conduits shall be jointed by approved couplings with ends of conduits tightly butted. Non-insulating compound shall be used in making up joints below grade or inside on grade to insure a watertight system.

15. Conduit connections to outlet boxes or cabinets shall be made with approved connectors, using locknuts and insulated throat bushings.

16. Complete raceway installation before starting conductor installation.

17. Contractor shall provide rubber grommets to fasten galvanized conduit to exterior structures made of dissimilar metals at all exterior locations to prevent galvanic corrosion.

18. Contractor shall provide rubber grommets to fasten galvanized conduit to supports which are also used by other systems utilizing piping of dissimilar metals to prevent galvanic corrosion.

B. Interior

1. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

2. All concealed conduits shall be installed in as direct a line as possible between outlets. No more than four quarter bends, or their equivalent, will be allowed between outlets. Feeder conduits shall follow arrangement shown on plans unless a change is authorized. Branch circuit conduits shall, in general, follow arrangement as shown as far as structural conditions permit. All exposed runs shall parallel buildings, walls, or partitions, and be supported on Kindorf Hangers to meet Title 24, Part 3, CEC.

C. Exterior

1. Exterior conduit including the sweep below grade and the vertical riser shall be galvanized rigid steel conduit, except where rigid non-metallic conduit is required for utility service conduits by the serving utility company.

2. No rigid non-metallic conduit (RNC) shall be installed above grade.

D. Underground

1. Two or more power **or** telecommunications conduit runs installed in a common trench shall be separated horizontally by a minimum of four inches (4”).

2. Two or more power **and** telecommunications conduit runs installed in a common trench shall be separated horizontally by a minimum of twelve inches (12”).

3. **All** electrical conduit runs installed in a common trench with other utility company lines, plumbing pipes, or heating pipes shall be separated horizontally from such lines by a minimum of twelve inches (12”).

4. Conduits installed underground and not under buildings shall have a minimum of 24” of cover over the top of the conduit.

5. Utility service conduits shall be installed according to the serving utility’s requirements for material, depth of cover, and separation.

6. Rigid non-metallic conduit shall be laid on excavated firm bed, sealed watertight and unless with 24 inch earth cover, shall have 3 inch minimum concrete encasement unless under concrete. Plastic conduit without encasement shall be random lay, “snaked”, not pulled tight. Plastic conduit laid in areas of reinforcing steel shall be supported independently at each threaded fitting. Plastic conduit joints shall be full solvent welded.

7. Rigid non-metallic conduit installed underground and not below a building slab shall have a galvanized rigid steel long radius elbow installed at the terminating end where the transition from horizontal to vertical occurs.

E. In Concrete Slabs

1. Conduit installed within concrete slabs shall be Schedule 80 PVC rigid non-metallic conduit or full weight galvanized rigid steel conduit.

2. Conduits in concrete slabs 3 inches thick or less shall not be of size larger than ¾ inch nominal trade size, and wired to top of reinforcing steel.

3. Conduit installed in concrete slabs shall be installed in the middle third of the slab thickness where practical, and have at least 1-inch concrete cover.

4. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

5. Conduit installed in concrete slabs shall be installed side-by-side horizontally and shall have no less than 1" spacing between each conduit to allow for concrete consolidation to prevent voids in the concrete. Conduits that are installed in concrete slabs shall be arranged such that they do not cross over other conduits within the concrete slab. Where crossing of conduits is unavoidable the crossing sets of conduits shall be installed below the slab. No more than 3 conduits shall be installed side-by-side in a concrete slab without special permission from the structural engineer.

6. Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.

7. Contractor shall be responsible for damages to membrane and shall repair it.

F. Below Grade Level Concrete Building Slab

1. All conduits below the building slab shall be Schedule 40 PVC rigid nonmetallic conduit or full weight galvanized rigid steel conduit, and shall have a 6" minimum cover below the floor slab measured from the bottom of the floor slab to the top of the conduit.

2. Rigid non-metallic conduits that are 1" trade size or smaller that are installed below the building slab shall transition from Schedule 40 PVC below the building slab to Schedule 80 PVC rigid nonmetallic conduit or galvanized rigid steel conduit, before passing into the concrete building slab and shall transition to galvanized rigid steel conduit or IMC within the concrete building slab before exiting and rising above the building slab.

3. Rigid non-metallic conduits that are 1 ¼" trade size or larger that are installed below the building slab shall have a galvanized rigid steel long radius elbow installed at the terminating end where the transition from horizontal to vertical occurs and the vertical riser shall be galvanized rigid steel conduit rising above the building slab.

4. Rigid non-metallic conduit installed underground and not below a building slab.

5. Where conduits rise through the building slab they shall be installed at sufficient depth so that the curved portion of any bends, sweeps, or 90's are not visible above the finished slab.

6. Contractor shall be responsible for damages to membrane and shall repair it.

G. Signal Systems

1. Separate 2” conduits between buildings shall be provided for each of the following systems – Fire Alarm, Burglar Alarm/Clock/Bell, Energy Management, Computer Network, Intercom/Telephone.

2. Two (2) spare 2” conduits shall be provided between buildings for future low voltage needs.

3. Two (2) spare 1” conduits shall be provided to each classroom and terminated in J-boxes above the ceiling for future low voltage needs.

4. Install telephone and signal system raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent.

5. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

H. In Beams and Footings

1. Conduit in concrete beam and footings shall be perpendicular to direction of beams unless otherwise indicated on structural drawings.

2. Conduit shown in concrete beam parallel to beams shall be installed at approximate mid-depth of beam.

I. Flexible Conduit

1. LFMC or FMC shall be used to connect motors and equipment subject to vibration, noise transmission, or movement to junction boxes, with a maximum length of 24-inches.

2. Install separate ground conductor across flexible connections.

3. Flexible conduits shall be independently suspended.

J. Hazardous Locations

1. Underground conduit **within** Class 1 areas shall be threaded rigid metal conduit or intermediate steel conduit per N.E.C. 511 and/or 514.

2. Underground conduit **below** Class 1 areas shall be rigid non-metallic conduit per N.E.C. 511 and/or 514.

3. Approved seal-off type fittings shall be used in Class 1 locations per N.E.C.

4. Fittings in hazardous areas shall be of the type approved for the particular hazard.

K. Health Care Facilities

1. PVC conduits are prohibited in health care facilities patient care areas per N.E.C. 517-13).

3.5 SURFACE MOUNTED RACEWAY INSTALLATION

A. Surface Mounted Raceways shall be used to provide raceway systems for branch circuits and data network voice, video and other low-voltage wiring.

B. Surface Mounted Raceways shall be used only in dry interior locations, as allowed in Article 388 (Surface Nonmetallic Raceways) of the California Electrical Code.

C. Surface Mounted Raceways and wire distribution systems shall contain no more than six current carrying conductors in each section or compartment. Where additional conductors are required, additional raceway shall be installed to accommodate additional conductors.

D. Electrical and mechanical rooms are specifically excluded from the use of non-metallic Surface Mounted Raceways.

~~3.6 METAL CLAD TYPE MC CABLE APPLICATION~~

~~A. Branch circuits **may** be Type MC cable only where they are completely concealed within walls or above ceilings.~~

~~B. Type MC cable **shall not** be permitted for feeders.~~

~~C. Type MC cable **shall not** be permitted underground.~~

3.7 METAL CLAD TYPE MC-PCS CABLE APPLICATION

A. Lighting branch circuits **may** be Type MC-PCS cable only where they are completely concealed within walls or above ceilings.

B. Type MC-PCS cable **shall not** be permitted for branch circuits other than the controlled lighting branch circuits of individual spaces.

C. Type MC-PCS cable **shall not** be permitted for feeders.

D. Type MC-PCS cable **shall not** be permitted underground.

3.8 METAL CLAD CABLE – INSTALLATION

A. Install metal clad cable in accordance with manufacturer's instructions and in strict accordance with CEC Article 330. Follow manufacturer's explicit instructions when connecting the cable to fittings and boxes. Connectors shall be firmly secured to the cable, but not over tightened. Connector shall be firmly attached to metal boxes.

B. Support metal clad cables every 6 feet and within 12 inches of boxes, per CEC Article 334, using separate spring metal clip or metal cable ties (not steel tie wire) for each cable. Metal clad cables shall not be bundled together.

C. Suspended ceiling drop wire may be used to directly support a maximum of two separate metal clad cables.

D. Provide separate drop wire above accessible ceiling, to support more than two metal clad cables.

E. Do not rest metal clad cables on ceiling tiles or allow contact with mechanical piping systems.

F. Bend metal clad cable per CEC Article 334.

G. Provide separate sleeves and/or fire barriers where metal clad cable penetrates firewalls, unless cable is UL listed for the application.

3.9 MODULAR WIRING SYSTEM APPLICATION

A. Modular wiring system shall be used for lighting system connection in accessible ceiling locations.

3.10 CONDUCTOR APPLICATION

A. Feeders and branch circuits shall be Type THHN/THWN insulated conductors in raceway.

B. Underground feeders and branch circuits shall be Type THWN or single-wire, Type UF insulated conductors in raceway.

C. Branch circuits for other than lighting circuits shall be Type THW or THHN/THWN insulated conductors in raceway. Lighting branch circuits shall be Type THW or THHN/THWN insulated conductors in raceway where exposed and may be metal-clad cable where concealed in ceilings and gypsum board partitions.

D. Minimum conductor size shall be #12 for power and lighting, #14 for 120V control circuits and #18 for 24V control circuits.

E. Remote control, signaling and power-limited circuits shall be Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.11 CONDUCTOR INSTALLATION

A. Conductors shall be continuous from outlet to outlet, no splices shall be made except within outlet or junction boxes.

B. Wiring at outlets shall be installed with at least 12 inches of slack conductor at each outlet.

C. Outlet and component connections shall be made to wiring systems and to ground. Electrical connectors and terminals shall be tightened according to manufacturer's published torque-tightening values. Torque values specified in UL 486A shall be used where manufacturer's torque values are not indicated.

D. Wire in panels, cabinets, pull boxes, and wiring gutters shall be squared, labeled, and neatly grouped with cable ties and fanned out to the terminals.

E. All branch circuits, fixture wiring joints, splices, and taps for conductors #10 and smaller shall be made with 3M "Scotchlock" connectors, or approved equal.

F. All branch circuits, fixture wiring joints, splices, and taps for conductors #8 and larger shall be made with two-bolt type solderless connectors or T & B "color keyed" compression lugs.

G. Bolt-type solderless connectors shall be torqued with a torque wrench according to the manufacturer's recommendations, and then retightened after 24-48 hours before taping. Owners' inspector shall be informed of this procedure during the waiting period and shall witness the act of retightening.

H. Connectors and lugs for terminating stranded conductors #8 and larger shall be machine crimp compression type.

I. All splices shall be taped with Scotch #88 plastic electrical tape with "Scotch Fill" where necessary for a smooth joint. Scotch #27 or #2520 shall be used for other than normal temperatures or conditions. All connections and splices shall be electrically perfect and in strict accordance with all code requirements.

J. No splices shall be made below grade in a manhole or pullholes without Engineer's written approval, and then shall be encapsulated with 3M potting kits per 3M Specifications. For larger gauge wire where 3M potting kits are prohibited Contractor shall use submersible UL listed Polaris connectors by NSi.

3.12 WIREWAY AND AUXILIARY GUTTER APPLICATION

A. Wireways and auxiliary gutters shall be used above and below panelboards, lighting relay cabinets, and terminal cabinets to accommodate large concentrations of wires.

3.13 PULL BOXES AND WIREWAYS:

A. Boxes shall be installed square and plumb. An engraved nameplate shall be installed on each box indicating its function. Nameplate shall be installed on the exterior of each box in unfinished areas and on the interior of each box in finished areas.

B. Wireways shall be installed with strip-type connectors with self-retained mounting screws. Hangers with two piece, hook together features shall be used to permit preassembly of wireway and hanger bottom plate before hanging on a preinstalled upper bracket.

C. Pull and junction boxes shall be installed as shown to ease the pulling of wire and to comply with CEC requirements.

3.14 WIRING DEVICES AND MATERIALS

A. Outlets shall be mounted at 18” minimum above finished floor unless otherwise noted.

B. The locations of outlets shown on drawings shall be located with respect to work of others and to be symmetrical with room layout.

C. Outlets in architectural patterned surfaces such as tile and finish panels shall be centered on intersections of four panels or in exact center of panels, unless otherwise shown on architectural plans or directed by Architect.

D. Outlet boxes for concealed work shall be one-piece steel knock out type with zinc coating. Boxes shall not be smaller than 4” square nominal size, unless otherwise indicated. Extension rings, plaster rings, and covers shall be provided as necessary for flush finish.

E. The Contractor shall inform himself of wall thickness throughout the building and shall provide outlet boxes of suitable depth that can be flush mounted and yet will be deep enough to contain the particular apparatus involved. Location of exposed pull or junction boxes will be subject to the Architect’s approval.

F. Outlet boxes on opposite sides of walls shall not be placed back-to-back, nor shall “through” boxes be employed (except where specifically permitted on the drawings by note).

G. Switches shall be mounted 48” to top of device box above finished floor unless otherwise noted.

H. Where more than one switch occurs at the same location, use multiple gang outlet boxes covered by a single plate; provide box partitions as required by the N.E.C.

I. Bar hangers shall be used to support outlet boxes in stud or furred partitions and ceilings. Attachment screws, devices, etc., shall be of the proper type to secure boxes to metal studs complemented by expansion shields to concrete and masonry.

J. All outlet boxes and particularly those supporting fixtures shall be securely anchored in place in an approved manner. Support outlet boxes and fixtures in acoustic ceiling areas from building structures, not from acoustic ceilings. All lighting fixture outlets shall be coordinated with mechanical, architectural, or other equipment to eliminate conflicts and provide a workable, neat installation.

K. Approved knock out holes shall be provided. Outlet boxes from which light fixtures will be suspended shall be equipped with 3/8” fixture studs fastened through from back of box.

L. Surface boxes of the cast metal threaded hub type with suitable gasketed covers shall be used for exposed conduit runs less than 5’ above a finished floor or where waterproof boxes are required.

M. Floor boxes shall be adjustable, brass trimmed with carpet flanges where carpet is indicated on architectural drawings.

N. Set floor boxes level and trim after installation to fit flush to finished floor surface.

O. Masonry boxes shall have conduit entrances to rear of box with depth as required to clear masonry.

P. Boxes shall be sized for number of conductors entering box.

Q. Wiring devices shall be securely fastened to the outlet box. Where the outlet box covers are back from the finished walls, the device shall be built out with washers so that it is rigidly held in place to the box. Metal extenders shall be provided in flammable construction per CEC.

R. All device screw slots shall be left in a vertical orientation.

S. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor and to outlet box with bonding jumper.

T. Connect ground terminal of isolated-ground receptacles to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

3.15 TERMINAL CABINETS AND CLOSETS

A. Terminal cabinets shall be installed level and identified with nameplate per schedule.

B. All conductors in terminal cabinets or closets shall be squared, labeled and secured neatly with wire ties.

C. All terminal cabinets shall be installed with the top of the trim at 6’-0” above the finished floor, unless otherwise indicated on the drawings.

D. Where space permits, terminal cabinets shall be surface mounted where they are not visible to the public.

E. A typewritten directory shall be mounted behind plastic in a metal holder welded to the inside of each terminal cabinet door showing a complete description of terminations in each cabinet.

3.16 PANELBOARDS

A. All panels shall have, in addition to conduit shown on the drawings, two ¾" and three 1" conduits stubbed to nearest accessible attic space.

B. All panels shall be installed with the top of the trim at 6'-0" above the finished floor, unless otherwise indicated on the drawings.

C. Where space permits, panels shall be surface mounted where they are not visible to the public.

D. A typewritten directory shall be mounted behind plastic in a metal holder welded to the inside of each panel door showing circuit numbers and complete description of all outlets on each circuit and an Arc-Flash Hazard Warning label shall be applied to each panelboard, switchboard and service entrance in accordance with CEC 110.16.

E. Labeling of all circuits at panel boards shall match the exact room names of each of the spaces. Verify exact room names with Owner prior to labeling.

F. Electrical loads shall be disaggregated into separate panelboards per the 2022 California Energy Code Section 130.5(b).

3.17 DISCONNECT DEVICES

A. Thoroughly examine site conditions for acceptance of disconnects switch installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

B. Coordinate locations of switches and equipment in the field to provide code required clearances in front of switches and to insure that switches are in sight of the controllers as described in NEC Article 430.

C. Install disconnect switches where indicated on the Drawings.

D. Install fuses in fusible disconnect switches.

E. Include construction channel and mounting hardware as required to support disconnect switch.

F. Provide engraved, machine screw retained nameplate on each disconnect switch. Name plate shall identify equipment and panelboard + branch circuit breaker.

3.18 SUPPORTING DEVICE APPLICATION

A. Hot-dip galvanized materials or nonmetallic channel and angle system components shall be used in damp locations and outdoors.

B. Steel materials shall be used in dry locations.

C. Support clamps for PVC raceways shall be click-type clamp system.

D. Strength of supports shall be adequate to carry present and future loads, times a safety factor of at least four with a minimum of 200-lb design load.

3.19 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, according to the following criteria, unless otherwise noted:

1. Wood – wood screws or screw-type nails.

2. Masonry – toggle bolts on hollow masonry units, expansion bolts on solid masonry units.

3. New Concrete – concrete inserts with machine screws and bolts.

4. Existing Concrete – expansion bolts.

5. Steel – welded threaded studs or spring-tension clamps on steel. Field welding shall comply with AWS D1.1. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.

6. Light Steel – sheet-metal screws.

7. Fasteners shall be selected so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.20 ELECTRICAL IDENTIFICATION

A. Each conductor of every system shall be permanently tagged in each panelboard, pull box, J-box, etc., in compliance with the Occupational Safety and Health Administration (OSHA).

B. Brady labels shall be used to identify terminals and destination of feeders, branch circuits, signal and control circuits, etc., at all terminations, junction boxes and pull boxes, and shall be coordinated with the nameplates in all boxes and equipment.

C. All terminals in the switchboards, panels, relays, switches, devices, starter terminals, etc., shall have Brady labels for identification to identify both ends of all wiring.

D. The Contractor shall furnish and install 1” x 3” x 3/32” thick laminated black Bakelite nameplates with a white core (unless specifically shown as red) engraved to produce white letters on black background for all items of electrical equipment, including 2-pole and 3-pole circuit breakers, panelboards, starters, relays, time switches and disconnect switches.

E. All devices shall have their branch circuit identified on the back side of device plate with a permanent type black marker, i.e. CT A-21. Identify panelboard and circuit number from which receptacles are served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

F. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

G. Panels having single-pole circuit breakers shall be provided with typed schedules mounted in welded metal holders behind plastic.

H. Clean surfaces that are to receive self-adhesive identification products before applying.

I. Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.

J. Identify raceways and cables with color banding as follows:

1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.

2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

3. Colors: As follows:

a. Fire Alarm System: Red.

b. Security System: Blue and yellow.

c. Telecommunication System: Green and yellow.

K. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

L. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.

M. All power conductors shall be identified in accordance with the following schedule:

1. 120/208V, 3 Phase, 4 Wire System.

a. Phase A: Black.

b. Phase B: Red.

c. Phase C: Blue.

d. Neutral: White.

e. Ground: Green

2. 120/240V, 3 Phase, 4 Wire System.

a. Phase A: Black.

b. Phase B (Stinger): Orange.

c. Phase C: Blue.

d. Neutral: White

e. Ground: Green

3. 277/480V, 3 Phase, 4 Wire System.

a. Phase A: Brown.

b. Phase B: Orange.

c. Phase C: Yellow.

d. Neutral: White with a colored stripe or gray.

e. Ground: Green.

4. Isolated ground conductor shall be green with a yellow stripe.

5. Clock wiring shall be 4 #14 TW or THWN, color coded as follows:

a.	Hot circuit	Black
b.	Correction circuit	Red
c.	Neutral	White
d.	Ground	Green

N. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

O. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.21 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Equipment shall be installed according to governing electric utility company's written requirements. Grounding and empty conduits shall be provided as required by utility company.

3.22 FIRESTOPPING

A. Seal all penetrations for work of this section through fire rated floors, walls and ceilings to prevent the spread of smoke, fire, toxic gas or water through the penetration, either before, during, or after the fire. The fire **and** temperature ratings of the penetration assembly shall be at least that of the floor, wall, or ceiling into which it is installed so that the original fire rating of the floor or wall is maintained as required by Article 300.21 of the California Electrical Code (CEC).

B. Where applicable, provide OZ Type CFSF/I and CAFSF/I fire seal fittings for conduit and cable penetrations through concrete and masonry walls, floors, slabs and similar structures. Where applicable, provide 3M fire barrier sealing penetration system, and/or Thomas and Bett Flame Safe Fire Stop System, and/or Chase Foam fire stop system, including wall wrap, partitions, caps and other accessories as required. All manufacturers' instructions and recommendations for installation of sealing fittings and barrier sealing systems.

C. The Contractor shall repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed new structures, surfaces and shall install new fireproofing where existing firestopping has been disturbed. The repair and refinishing of materials and other surfaces shall be by skilled mechanics of the trades involved.

3.23 REFINISHING AND TOUCHUP PAINTING

A. The Contractor shall clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location. He shall follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

B. Damage to galvanized finishes shall be repaired with zinc-rich paint recommended by manufacturer.

C. Damage to PVC or paint finishes shall be repaired with matching touchup coating recommended by manufacturer.

D. See Section 09900, "Painting".

3.24 FIELD QUALITY CONTROL

A. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.

1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.

2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.

3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.

4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.

5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

3.25 SYSTEM TESTING AND STARTUP

A. Refer to Specification Section 26 95 00 "Electrical Acceptance Tests" for minimum required systems testing and startup.

3.26 TITLE 24 - PART 6 DOCUMENTATION OF INSTALLATION AND ACCEPTANCE FOR ELECTRICAL POWER DISTRIBUTION SYSTEMS

A. The Contractor shall prepare and submit the following Certificates of Installation:

1. Electrical:

a. Certificate of Installation – Electrical Power Distribution (NRCI-ELE-01-E)

END OF SECTION 260500

SECTION 260526
GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

1.3 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. Product Data for grounding rods, connectors and connection materials, and grounding fittings.

C. Qualification data for firms specified in "Quality Assurance" Article to demonstrate their capabilities and experience.

D. Field tests and observation reports certified by the testing organization and indicating and interpreting the test reports for compliance with performance requirements.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7, or a full member company of the InterNational Electrical Testing Association (NETA).

1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Chance: A. B. Chance Co.
2. Erico Inc.; Electrical Products Group.
3. Galvan Industries, Inc.
4. Lyncole XIT Grounding.
5. Raco, Inc.
6. Thomas & Betts, Electrical.

2.2 GROUNDING AND BONDING PRODUCTS

A. Where types, sizes, ratings, and quantities indicated are in excess of California Electrical Code (CEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2.3 WIRE AND CABLE GROUNDING CONDUCTORS

A. Conform to CEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

1. Material: Copper.

B. Equipment Grounding Conductors: Insulated with green color insulation.

C. Grounding-Electrode Conductors: Stranded cable.

D. Isolated Grounding Conductors: Insulated with green color, yellow striping insulation.

E. Bare Copper Conductors: Conform to the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

2.4 TELECOMMUNICATION MAIN GROUND BUS

A. Telecommunication main ground bus: 4”W x 1/4”H x 12”L UL listed and pre-assembled telecommunication main ground bus consisting of bare annealed-copper bar having

pre-drilled hole patterns to accommodate two-hole lugs and with two 3/8” diameter mounting holes spaced 5.75” apart, 2-insulators, 2-stainless steel stand-off brackets, 4-stainless steel bolts, 4-lock washers and 4-flat washers + lug kit. Chatsworth model 40158-12, or equivalent.

2.5 TELECOMMUNICATION GROUND BUS

A. Telecommunication ground bus: 2”W x 1/4”H x 12”L UL listed and pre-assembled telecommunication ground bus consisting of bare annealed-copper bar having pre-drilled hole patterns to accommodate two-hole lugs and with two 3/8” diameter mounting holes spaced 5.75” apart, 2-insulators, 2-stainless steel stand-off brackets, 4-stainless steel bolts, 4-lock washers and 4-flat washers + lug kit. Chatsworth model 40156-12, or equivalent.

2.6 MISCELLANEOUS CONDUCTORS

A. Grounding Bus: Bare, annealed-copper bars of rectangular cross section.

B. Braided Bonding Jumpers: Copper tape, braided No. 30 AWG bare copper wire, terminated with copper ferrules.

C. Bonding Straps: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

2.7 CONNECTOR PRODUCTS

A. Grounding connections shall be exothermic welded, bolted clamp terminal, or pressure connector type.

B. Exothermic-Welded Connections shall be provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

C. Bolted Clamp connectors shall be heavy-duty type.

D. Pressure connectors shall be high-conductivity-plated units.

2.8 GROUNDING ELECTRODES AND TEST WELLS

A. Grounding Rods shall be sectional type; copper-clad steel.

1. Size: 3/4 inch by 120 inches.

B. Plate Electrodes shall be copper, square or rectangular shape. Minimum 0.10 inch thick, size as indicated.

C. Test Wells shall consist of a Christy Concrete Products F8 Box, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The conduit system, supports, cabinets, switchboards, etc., and neutral conductors must be permanently and effectively grounded by means of approved ground clamps, in accordance with Title 24 of the California Code of Regulations. The neutral shall only be grounded at the main service location unless specifically noted otherwise on the drawings or required by the California Electrical Code.

B. This Contractor shall exercise every precaution to obtain good contacts at all panel boxes, pull boxes, etc. Where it is not possible to obtain good contacts, the conduits shall be bonded around the boxes with a #6 AWG gauge, THWN wire with ground clamps.

C. Where there is more than one building supplied from a common service, provide a grounding electrode system at each building per CEC 250.50 and connect per CEC 250.32(B)(1).

3.2 APPLICATION

A. General

1. All equipment cases, motor frames, etc. shall be completely grounded to satisfy applicable code requirements.

2. The interior hot and cold water piping and the interior above ground gas piping shall be bonded to the building service equipment per CEC 250.104.

3. Do not use underground gas piping as a grounding electrode.

B. Equipment Grounding Conductor

1. Pull an Equipment Grounding Conductor, insulated green, in **ALL** conduits, both metallic and non-metallic, unless they are designated for telephone or data cables.

2. Each disconnect switch shall have an Equipment Grounding Conductor (lay in wire type) which shall be used for grounding the disconnect enclosure. The ground wire shall continue and be connected to the enclosure of the equipment served.

3. Feeders and branch circuits shall be provided with an insulated grounding conductor run with the circuit conductors. This grounding conductor shall be in addition to the ground path provided by the continuously grounded metallic raceway system that encloses the phase and neutral conductors.

4. Comply with CEC Article 250 for types, sizes, and quantities of Equipment Grounding Conductors, except where specific types, larger sizes, or more conductors than required by CEC are indicated.

5. Install separate Equipment Grounding Conductor in branch circuit runs from computer area power panels or power-distribution units.

C. Isolated Grounding Conductor

1. Pull a separate Isolated Grounding (IG) conductor, insulated green with yellow stripe, to each isolated ground receptacles, in addition to the equipment-grounding conductor.

2. The IG Conductor shall begin at the grounding source of the applicable derived system or service and shall not be connected to any neutral conductor or any item not isolated from the system ground. Each IG circuit shall have a separate neutral **and** a separate IG Conductor (not used for more than one circuit).

D. Isolated Equipment Enclosure Circuits

1. For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install an Isolated Grounding Conductor.

E. Air-Duct Equipment Circuits

1. Install an Equipment Grounding Conductor to duct-mounted electrical devices operating at 120 V and above, including air cleaners and heaters. Bond conductor to each unit and to air duct.

F. Water Heater, Heat-Tracing, and Anti-frost Heater Circuits

1. Install a separate Equipment Grounding Conductor to each electric water heater, heat-tracing assembly, and anti-frost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

G. Signal and Communication Systems

1. For telephone, alarm, voice and data, and other communication systems, provide a No. 3/0 AWG minimum insulated copper grounding conductor in raceway from the building grounding-electrode system to a telecommunication main ground bus at the building telecommunication service entrance telephone backboard.

H. MDF Cabinets, IDF Cabinets, and Remote Telecommunication Cross Connect Rooms

1. Each MDF Cabinet and each IDF Cabinet shall have a telecommunication ground bus installed within the cabinet and the telecommunication ground bus shall be connected to the telecommunication main ground bus with a No. 4 AWG minimum insulated copper grounding conductor installed within a raceway.

I. Terminal Cabinets

1. Terminate grounding conductor on cabinet grounding terminal.

J. Metal Poles Supporting Outdoor Lighting Fixtures

1. Ground pole to equipment grounding conductor run with supply branch circuit.

3.3 INSTALLATION

A. General: Ground electrical systems and equipment according to CEC requirements, except where Drawings or Specifications exceed CEC requirements.

B. Grounding Rods: Locate a minimum of 1-rod length from each other and at least the same distance from any other grounding electrode.

1. Drive until tops are 2 inches below finished floor or final grade, except as otherwise indicated.

2. Interconnect with grounding-electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make these connections without damaging copper coating or exposing steel.

C. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

D. Underground Grounding Conductors: Use bare copper wire. Bury at least 24 inches below grade.

E. Metal Water Service Pipe: Provide insulated copper grounding conductors, sized as indicated, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding-clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Do not install a grounding jumper across dielectric fittings. Bond grounding-conductor conduit to conductor at each end.

F. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding-clamp connectors.

G. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

H. Test Wells: One for each driven grounding electrode, except as otherwise indicated. Set top of well flush with finished grade or floor. Fill with 1-inch- maximum-size crushed stone or gravel.

I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to CEC Paragraph 250.52(A)(3), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. Where base of concrete foundation is less than 20 feet in length, coil excess conductor within base of concrete foundation. Bond grounding conductor to reinforcing steel to at least 4 locations, and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

3.4 CONNECTIONS

A. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Non-contact Metal Raceway Terminations: Where metallic raceways or metallic sheathed cables terminate at metal housings without mechanical and electrical connection to the housing, terminate each metallic raceway or metallic sheathed cable with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits or sheathed cables at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and grounding rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Manholes:

1. Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor.

2. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall.

3. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

B. Connections to Manhole Components:

1. Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole, to ground rod or grounding conductor.

2. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor.

3. Train conductors level or plumb around corners and fasten to manhole walls.

4. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

3.6 FIELD QUALITY CONTROL

A. Refer to Specification Section 269500 “Electrical Acceptance Tests” for minimum required testing of Grounding System.

3.7 ADJUSTING AND CLEANING

A. Restore surface features, including vegetation, at areas disturbed by work of this Section. Reestablish original grades, except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 02 Section "Landscaping." Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 260526

SECTION 262416
PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. Furnish and install panelboards as herein specified and as shown on Drawings.

1.3 REFERENCES

A. The panelboards and overcurrent protection devices referenced herein shall be designed and manufactured according to the following appropriate specifications.

1. NFPA 70 – 2019 California Electrical Code (CEC).

2. NEMA PB 1 - Panelboards

3. NEMA PB 1.1 – General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

4. UL 489 - Molded Case Circuit Breakers.

5. UL 67 – Standards for Panelboards.

1.4 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. Shop Drawings

1. Submit Shop Drawings for each panelboard indicating front and side enclosure elevations with overall dimensions, conduit entrance locations and requirements, nameplate legends, one-line diagrams, equipment schedule and switchboard instrument details.

C. Test Reports

1. Submit certified reports of Independent Tests and Observations indicating and interpreting test results specified in Part 3 of this Section.

2. Submit calibration record for all testing devices used.

3. Submit certificates, signed by Contractor, certifying that Independent Testing Agency complies with requirements specified in Section 260100 / 269500, Article 1.2.

D. Operation and Maintenance Data

1. Submit operation and maintenance data for panelboards to include in “Operations and Maintenance Instructions” manuals specified in Division 01 and Specification Section 260100, Article 1.6, including detailed manufacturer’s written instructions on adjusting overcurrent protective devices.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.

B. Each panelboard shall be delivered in individual shipping splits for ease of handling. They shall be individually wrapped for protection and mounted on shipping skids.

C. Inspect and report concealed damage to carrier within their required time period.

D. Store in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect structure from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.

E. Handle in accordance with NEMA PB 1.1 and manufacturer's written instructions. Lift only by lifting means provided for this express purpose. Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.

1.6 PROJECT CONDITIONS

A. Verify dimensions by field measurements.

B. Determine suitable path for moving switchboard into place considering project conditions.

C. Verify clearance requirements. Locate switchboard to meet installation tolerances.

D. Revise locations and elevations from those indicated as required to suit project conditions.

1.7 WARRANTY

A. Manufacturer shall warrant equipment to be free from defects in materials and workmanship for the lesser of one (1) year from date of installation or eighteen (18) months from date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. This design is based on the use of equipment manufactured by Square D Company. Subject to compliance with project requirements, equivalent products by one of the following manufacturers may be considered:

1. Square D Company
2. General Electric Company
3. Eaton
4. Siemens

2.2 PANELBOARDS - GENERAL

A. Panelboards shall be provided as shown on plans and described herein.

B. Panelboard enclosures shall be a minimum of 20” wide and 5.75” deep unless otherwise shown. Panelboards shall be totally flat with flush keyed locks. Enclosures shall be NEMA 1 for panelboards that are installed indoors and NEMA 3R for panelboards that are installed outdoors. Where more stringent panelboard enclosure requirements are specified on the panel schedules, the requirements specified on the panel schedule shall be provided.

C. Fronts shall be cold rolled sheet steel painted with ANSI 61 gray enamel over a rust inhibitor. They shall be equipped with door, flush hinges, and flush proper cylinder tumbler lock, metal circuit card holder, and quarter turn adjustable trim clamps. Panel locks shall be keyed alike.

D. Panel shall consist of reinforced corrosion resistant galvanized sheet steel frame with silver plated copper bus bars and circuit breakers properly supported to prevent vibration breakage in handling. All terminals shall be solderless type suitable for specified conductors of size indicated.

E. Each panelboards shall have a full size neutral bus. The neutral bus shall be 200% rated when supplied from a double neutral feeder. Each panelboards shall also have a full size equipment ground bus. In addition to the equipment ground bus, provide an isolated ground bus when supplied from a feeder which includes an isolated grounding conductor.

F. Branch circuit breakers shall be molded case, bolt-on, and fully interchangeable without disturbing adjacent units. All 2-pole and 3-pole breakers shall have common trips. Circuit breakers supplying Class 1 transformers shall be lockable in the off position.

G. Branch panelboards and overcurrent protection devices shall have a minimum short circuit rating of 10,000 RMS symmetrical AIC (120/208V).

H. Distribution panelboards and overcurrent protection devices shall have a minimum short circuit rating of 42,000 RMS symmetrical AIC (120/208V).

I. All Panelboards shall be fully rated as shown on Drawings; series-rating shall not be allowed.

J. Panelboards shall bear an Arc-Flash Hazard Warning label in accordance with CEC Article 110.16.

K. Breakers for switching lights shall be type SWD, rated for switching duty. Breakers for mechanical equipment shall be HACR type.

L. All spaces shall have hardware.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine area to receive panelboards to provide adequate clearance for panelboard installation.

B. Check that working space is level and free of irregularities.

C. Start work only after unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Panelboards shall have, in addition to conduit shown on the drawings, two ¾" and three 1" conduits stubbed to nearest accessible attic space.

B. Panelboards shall be installed with the top of the trim at 6'-0" above the finished floor, unless otherwise indicated on the drawings.

C. Where space permits, panelboards shall be surface mounted where they are not visible to the public.

D. Panelboards shall have a typewritten circuit directory installed mounted behind plastic in a metal holder that is welded to the inside of each panel door. The type written circuit directory shall show circuit numbers and complete description of all outlets on each circuit and

E. An Arc-Flash Hazard Warning label shall be applied to each panelboard in accordance with CEC 110.16.

F. Labeling of all circuits at panelboards shall match the exact room names of each of the spaces. Verify exact room names with Owner prior to labeling.

G. Electrical loads shall be disaggregated into separate panelboards per the 2019 California Energy Code Section 130.5(b).

3.3 CONNECTIONS

A. Connect panelboards and components to wiring systems and to ground as indicated and instructed by manufacturer.

B. Tighten electrical connectors and terminals, including screws and bolts, according to manufacturer’s published torque-tightening values. Where manufacturer’s torque values are not indicates, use those specified in UL 786A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Refer to Specification Section 269500, Electrical Acceptance Testing, for minimum required switchboard testing by Contractor and Independent Testing Agency.

3.5 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement per manufacturer's specifications.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

C. Adjust any circuit breaker trip and time delay settings to values as instructed by the Engineer.

3.6 CLEANING

A. Upon completion of installation, inspect interior and exterior of switchboards. Remove paint spatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 262416

SECTION 266100
LIGHTING CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 SUMMARY

A. The Contractor shall furnish, install, connect, commission, test and place into operation a complete system of lighting control equipment in accordance with the requirements of 2022 California Energy Code, California Code of Regulations Title 24, Part 6, and as herein specified.

B. Basis of Design for lighting control systems: Lighting control systems are primarily based on the use of a distributed digital lighting management system for control of indoor lighting systems and astronomic time clock controls for outdoor lighting systems and sign lighting.

C. Provide lighting control equipment as indicated by drawings and schedules, including but not limited to, digital lighting management system dimming equipment, occupancy sensors, daylight sensors (photosensors), astronomic time clocks and multi-pole lighting relays and contactors and wiring.

D. Mandatory Indoor Lighting Controls:

1. Area Controls – Provide area controls in each space to facilitate the manual control of lighting within that space.

2. Multi-level controls – Provide multi-level controls to facilitate the uniform reduction of lighting energy used in each space. Multi-level controls shall be accomplished through dimming.

3. Automatic Shutoff Controls – Provide occupancy sensors in each space to automatically shut-OFF the lighting when the space is unoccupied.

4. Automatic Daylighting Controls – Provide daylight sensors in each daylit area and automatically control lighting fixtures within the daylit areas separately from the fixtures located in non-daylit areas.

5. Demand Responsive Controls – Provide controls that are capable of receiving and automatically responding to a demand response signal.

E. Mandatory Outdoor Lighting Controls:

1. Outdoor incandescent lighting – Provide a motion sensor at each outdoor incandescent luminaire that is rated over 100-watts.

2. Controls for outdoor lighting – Outdoor lighting shall be controlled by an astronomic time-switch that automatically turns OFF the outdoor lighting when daylight is available.

3. Motion Sensor Controls – Provide a motion sensor control at each outdoor lighting fixture that is located 24-feet or less above the ground; except lighting fixtures rated 40-watts or less.

F. Provide lighting control systems and equipment as indicated on drawings and schedules, including but not limited to, network lighting control system, network ceiling mounted occupancy sensors, network dimming manual control stations, network daylighting sensors (photosensors), network dimming control relays, network plug load control relays, network bridges, network gateways, network automated demand response control interface, network lighting control system integration for nLight enabled lighting fixtures, configuration tools, programming, configuration and documentation software, wall switches with integral occupancy sensors, emergency lighting control devices, astronomic time-switch controls and lighting control panels, photoelectric relays, and multi-pole lighting relays and contactors.

1.3 COORDINATION

A. Confirm compatibility and interface of lighting control equipment with lighting fixtures, LED drivers and ceiling systems. Report discrepancies to the Architect or Electrical Engineer, and defer ordering until clarified.

B. Coordinate with Divisions 21-25 to avoid conflicts between supports, fittings, and mechanical equipment.

1.4 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. Shop Drawings:

1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.

2. Show exact location of all digital devices, including at minimum sensors, room controllers, and switches for each area on reflected ceiling plans.

3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.

4. Network riser diagram including floor and building level details. Include network cable specification and end-of-line termination details, if required. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.

C. Product Data: Catalog sheets, specifications and installation instructions.

D. Include data for each device which:

1. Indicates where sensor is proposed to be installed.

2. Prove that the sensor is suitable for the proposed application.

1.5 QUALITY ASSURANCE

A. Nothing in these Drawings or Specifications shall be interpreted as to permit any device, system, or work that is not in compliance with the current California Code of Regulations. Where work is detailed and/or specified to a more restrictive standard or higher requirement, that standard or requirement shall govern such work. Applicable codes and regulations include, but are not limited to, the following:

1. All lighting control devices and systems shall be certified by the manufacturer as meeting the requirements of the current California Code of Regulations Title 20, Appliance Efficiency Regulations.

2. All work, commissioning and testing shall fully comply with the 2022 California Energy Code.

1.6 CODES AND STANDARDS

A. All work and materials shall fully comply with current rules and regulations of all applicable codes. Nothing in these Drawings or Specifications shall be interpreted as to permit any work not in compliance with these codes. Where work is detailed and/or specified to a more restrictive standard or higher requirement, that standard or requirement shall govern such work. Installation shall comply with the following codes and standards:

1. California Code of Regulations (CCR)

   a. Title 8, Industrial Relations

   b. Title 17, Public Health

   c. Title 24, Building Standards

2. 2022 California Building Code.

3. 2022 California Fire Code.

4. 2022 California Electrical Code.

5. 2022 California Energy Code.

6. Local Codes.

7. ANSI/TIA/EIA-568-C-2012 Commercial Building Telecommunications Standard

8. ANSI/TIA/EIA-607-B-2013 Grounding and Bonding Requirements for Telecommunications in Commercial Buildings

9. BICSI TDMM Telecommunications Distribution Methods Manual 12th Edition

10. NEMA VE1 Cable Tray Systems

11. NEMA VE2 Cable Tray Installation Guides

12. UL 467 Grounding and Bonding Equipment.

13. UL 1479 Fire Tests of Through-Penetration Firestops

1.7 WARRANTY

A. The **Warranties** specified in this Article shall not deprive the Owner of other rights the Owner may have under 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. Provide five-year manufacturer's warranty on all digital lighting management system room control devices and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. This design is based on the use of nLight network lighting controls equipment manufactured by Acuity Brands nLight. Subject to compliance with project and specification requirements, equivalent products by the following manufacturers may be considered if a complete substitution request including shop drawings is submitted and approved prior to bid.

1. Network Lighting Controls nLight

2. Cooper Greengate

3. WattStopper

B. System: Network Lighting Controls nLight

2.2 NETWORK CEILING MOUNTED OCCUPANCY SENSOR

A. Network ceiling mounted occupancy sensors shall be dual technology digital passive infrared and microphonic occupancy sensors.

B. Network ceiling mounted occupancy sensors shall include the following features:

1. Communicates with the nLight network;

2. Low voltage auxiliary relay rated 1-amp at 24VAC/VDC with 2#20 AWG wire leads;

3. RJ45 port, RJ45 splitter and Category 5e patch cable;

4. Physical Description: Size: 4.55” diameter, 1.55” deep; Weight: 6oz; Color: Matte White;

5. Mounting: Ceiling Tile / Gypsum board surface, or 3.5” octagonal box, or single-gang handy box;

C. Network ceiling mounted occupancy sensors shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

D. nLight product numbers: nCM PDT 9 RJB AR (in offices and spaces less than 250-square-feet); nCM PDT 10 RJB AR (in corridors and spaces greater than 250-square-feet); nCM PDT 6 RJB AR (only in spaces with ceiling height greater that 15-feet);

2.3 SINGLE-ZONE NETWORK DIMMING MANUAL CONTROL STATIONS

A. Single-zone network dimming manual control stations shall include the following features:

1. Communicates with the nLight network;

2. Two RJ45 ports;

3. Physical Description: Size: 2.74” high, 1.68” wide, 1.63” deep; Weight: 2oz; Color: Matte White;

4. Three buttons: “ON/OFF”; up arrow; and down arrow

5. Mounting: Single-gang, 2-3/4” deep switch box with single gang plaster ring, or multi-gang switch box with multi-gang plaster ring matching the number of control stations where multiple control stations are collocated.

B. Network dimming manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

C. nLight product number: nPODM DX; Coordinate device color with the architect and Owner prior to ordering. Device shall be compatible with wall plates having decora style openings. Provide and install a decora style wall plate matching the switch color at each switch. Provide multi-gang wall plates at multi-gang switch locations.

2.4 FOUR-SCENE NETWORK DIMMING MANUAL CONTROL STATIONS

A. Four-scene network dimming manual control stations shall include the following features:

1. Communicates with the nLight network;

2. Two RJ45 ports;

3. Physical Description: Size: 2.74” high, 1.68” wide, 1.63” deep; Weight: 2oz; Color: Matte White;

4. Eight buttons custom engraved: “ON”; “OFF”; “ENERGY”; “A/V”; “DIM-50%”; “DIM-5%”; up arrow; and down arrow

5. Mounting: Single-gang, 2-3/4” deep switch box with single gang plaster ring, or multi-gang switch box with multi-gang plaster ring matching the number of control stations where multiple control stations are collocated.

B. Network dimming manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

C. nLight product number: nPODM 4S DX; Coordinate device color with the architect and Owner prior to ordering. Device shall be compatible with wall plates having decora style openings. Provide and install a decora style wall plate matching the switch color at each switch. Provide multi-gang wall plates at multi-gang switch locations.

2.5 DIGITAL KEYED SWITCH MANUAL CONTROL STATIONS

A. Digital keyed switch manual control stations shall include the following features:

1. Communicates with the nLight network;

2. Two RJ45 ports;

3. Physical Description: Size: 4” high, 1.3” wide, 1.63” deep; Weight: 2oz; Color: Matte White;

4. Key action: Return-to-center for momentary.

5. Pilot LED’s to indicate on or off status.

6. Mounting: Single-gang, 2-3/4” deep switch box with single gang plaster ring, or multi-gang switch box with multi-gang plaster ring matching the number of control stations where multiple control stations are collocated.

B. Digital keyed switch manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

C. nLight product number: nPOD KEY; Coordinate device color with the architect and Owner prior to ordering. Device shall be compatible with wall plates having decora style openings. Provide and install a decora style wall plate matching the switch color at each switch. Provide multi-gang wall plates at multi-gang switch locations.

2.6 NETWORK DAYLIGHTING SENSORS

A. Network daylighting sensors shall be closed loop photosensors that measure the ambient light in the space and provide automatic dimming daylight harvesting capabilities for any load type connected to the network. Daylighting sensors shall be interchangeable without the need for rewiring.

B. Network daylighting sensors shall include the following features:

1. Communicates with the nLight network;

2. RJ45 port, RJ45 splitter and Category 5e patch cable;

3. LED indicator;

4. Physical Description: Size: 4.55” diameter, 1.55” deep; Weight: 6oz; Color: Matte White;

5. Mounting: Ceiling Tile / Gypsum board surface, or 3.5” octagonal box, or single-gang handy box;

C. Network dimming manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

D. nLight Product Number: nCM ADCX RJB.

2.7 NETWORK DIMMING CONTROL RELAYS

A. Network dimming control relays shall automatically bind the room loads to the connected devices in the space. The quantity of network dimming control relays shall be provided to match the number of control zones required in each space.

B. Network dimming control relays shall be the On/Off/Dimming type and include the following features:

1. Communicates with the nLight network;

2. One 120/240/277VAC, 16-amp, latching lighting relay;

3. Sinks 100mA; 0-10VDC dimmable LED drivers;

4. Two RJ45 ports;

5. LED indicator;

6. Physical Description: Size: 3.38” high x 2.53” wide x 1.83” deep + ½” chase nipple; Weight: 6oz; Color: White;

7. Mounting: Mount to a 5S x 2.5” deep large capacity outlet box;

C. Network dimming manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

D. nLight Product Number: nPP16 (D).

2.8 NETWORK PLUG LOAD CONTROL RELAYS

A. Network plug load control relays shall automatically bind a rooms controlled receptacles loads to the network occupancy sensor in the space.

B. Network plug load control relays shall include the following features:

1. Communicates with the nLight network;

2. One 120-volt, 20-amp, UL general purpose latching relay

3. Two RJ45 ports;

4. LED indicator;

5. Physical Description: Size: 3.38” high x 2.53” wide x 1.83” deep + ½” chase nipple; Weight: 6oz; Color: Blue;

6. Mounting: Mount to a 5S x 2.5” deep large capacity outlet box;

C. Network dimming manual control stations shall be nLight Network Lighting Controls communication compatible and powered through the nLight bus.

D. nLight Product Number: nPP20 PL

2.9 NETWORK BRIDGE

A. The network bridge shall be a linear topology subnet to connect nLight network for centralized control.

B. Network bridge shall include the following features:

1. Communicates with the nLight network;

2. Eight RJ-45 network ports; two Class 2 power supply input terminals;

3. Remotely configurable and upgradeable;

4. Push-button programmable;

5. Green LED indicators for each port;

6. Distributes bus power between ports;

7. Supports up to 128 nLight devices per port;

8. Bridge port identification stickers and commissioning card;

9. Physical Description: Size: 4.90” high x 4.90” wide x 1.05” deep; Color: White;

10. Mounting: Mount to a 4S x 2.125” deep outlet box;

C. Provide and install one PS 150, 150mA, 120/277V power supply at each network bridge mounted to 4S outlet box with the network bridge.

D. nLight Product Number: nBRG 8 KIT

2.10 NETWORK GATEWAY

A. The network gateway shall be a linear topology subnet to connect nLight network bridges for centralized control and shall have a touch screen control user interface.

B. Network gateway shall include the following features:

1. Communicates with the nLight network;

2. Two RJ-45 nLight bus ports; one touch screen interface power network port; one Ethernet port; two Class 2 power supply input terminals;

3. Remotely configurable and upgradeable;

4. Push-button programmable;

5. Green LED indicators for each port;

6. Supports up to 128 nLight devices per port;

7. Bridge port identification stickers and commissioning card;

8. Physical Description: Size: 4.90” high x 4.90” wide x 1.05” deep; Color: White;

9. Mounting: Mount to a 4S x 2.125” deep outlet box;

10. One LCD touch screen user interface;

C. Provide and install one FCS PS 10, 10W, 120/277V power supply at each network gateway mounted to 4S outlet box with the network gateway.

D. nLight Product Number: nGWY2 KIT

2.11 NETWORK AUTOMATED DEMAND RESPONSIVE CONTROL INTERFACE

A. Provide and install a network automated demand responsive control interface. The network automated demand responsive control interface shall receive and automatically respond to OpenADR 2.0a messaging protocol and shall respond by adjusting the peak lighting power demand to 85-percent of maximum lighting power demand.

B. Network automated demand responsive control interface shall include the following features:

1. Communicates with the nLight network;

2. One micro USB power connector; one 10/100 BaseT Ethernet;

3. Physical Description: Size: 1.06” high x 2.76” wide x 3.94” deep; Color: White;

4. Mounting: Wall mount;

C. Provide and install one power supply cord at network automated demand responsive control interface;

D. nLight Product Number: nADR

2.12 PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE

A. Programming shall be provided by the Contractor through a web-based suite of applications that gives the programmer the ability to remotely configure and monitor nLight network luminaires and nLight control devices.

B. The Contractor shall completely program and configure the lighting control system to comply with 2022 California Energy Code requirements.

C. Provide one nCOMKIT and commissioning tool interface;

D. Communication Protocol: Programming software shall communicate with nGWY2 over LAN IP network and with nLight network directly through nCOMKIT and commissioning tool interface and shall be able to program up to 20,000 network controlled devices.

E. System Requirements: Laptop or PC with Windows 7 or newer operating system; 4GB RAM and 2GB minimum available memory; Internet Explorer 10 and newer, Chrome, or Firefox browsers.

F. Acuity Controls Product Number: SensorView 13, nCOMKIT

2.13 WALL SWITCH WITH INTEGRAL OCCUPANCY SENSOR

A. Wall switches with integral occupancy sensors shall be comprised of an all digital, passive infrared technology (PIR) sensor to detect human presence.

B. System shall have field selectable auto-ON or manual-ON operating modes and shall be factory set to the manual-ON operating mode.

C. Wall switches with integral occupancy sensors shall be rated: 120/277-volt; 60Hz and shall have separate neutral and equipment grounding connection wire leads.

D. Wall switches with integral occupancy sensing shall be Sensor Switch model WSX (in Janitors closets and storage rooms having only one lighting fixture).

2.14 CONTACTORS AND AUXILIARY RELAYS

A. Contactors and relays shall comply with NEMA ICS 2.

B. Devices are electrically operated and mechanically held. Number of poles and ratings are as indicated. Coordinate rating of each unit with type of load served, including tungsten filament and inductive-type loads.

C. Modular Single-Pole Relays shall be split-coil, momentary-pulsed type, knockout mounting.

1. Low-Voltage Leads: 5-pin plug connector.

2. Pilot Contacts: Single pole.

3. Rated Capacity: 20A, 125VAC for 120-volt lighting loads, and 20A, 277VAC for 277-volt lighting loads.

4. Endurance: 50,000 cycles at rated capacity.

2.15 EMERGENCY LIGHTING CONTROL DEVICES

A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a circuit providing normal lighting to an area. The unit provides normal dimming and ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:

1. 120/277 volts, 50/60 Hz, 20 amp dimming LED driver rating

2. Push to test button

3. Auxiliary contact for remote test or fire alarm system interface

B. nLight Product Numbers: nPP16 ER SHUNT.

2.16 NLIGHT ENABLED NETWORK LIGHTING FIXTURES

A. Lighting fixtures specified as nLight enabled shall have an integral nLight network interface and be integrated into the nLight network lighting control system.

2.17 LIGHTING CONTROL PANEL

A. The lighting control panels shall be the nLight network connected 8-relay cabinet including the following features:

1. Communicates with the nLight network;

2. Eight 20-amp relays rated for 277-volts; able to separately switch up to eight 120/277 VAC loads.

3. Eight 0-10VDC dimming outputs

4. Two RJ45 ports

5. Integrated power supply for nLight bus and auxiliary device power;

6. Heavy duty terminal blocks;

7. Push button programming;

8. NEMA 1 Enclosure;

9. Physical Description: Size: 14.45” high x 14.41” wide x 4.05” deep; Weight: 12lbs. Color: White;

10. Mounting: Wall mount;

B. nLight Product Numbers: nLight Relay Panel model ARP INTENCO8 NLT 8FCR MVOLT 1VB HLK SM

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETING

A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:

1. Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.

2. Review the specifications for low voltage control wiring and termination.

3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.

4. Discuss requirements for integration with other trades.

3.2 INSTALLATION, CALIBRATION AND PROGRAMMING SERVICES

A. Install all devices and wiring in a professional manner. All line voltage connections shall be tagged to indicate circuit and switched legs.

B. Category 5e network cables shall not have boots installed at the RJ45 plug connectors.

C. Provide and install category 5e cable with RJ-45 connectors interconnecting all control device, bridges and gateways. If pre-terminated cable is not used for room/area wiring, the contractor is responsible for testing each field-terminated cable following installation, and shall supply the lighting controls manufacturer with test results. Low voltage wiring topology must comply with manufacturer's specifications. Contractor shall route network wiring as shown in submittal drawings as closely as possible, and shall document final wiring location, routing and topology on as built drawings.

D. Provide and install one ¾" conduit with 2#12 copper THWN/THHN + 1#12 copper ground between nearest constant hot portion of lighting branch circuit and each PS 150 power supply. Connect line voltage to each power supply and connect the Class 2 low voltage wiring between the PS 150 power supply and network bridge.

E. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Before start up, the contractor shall test all devices to ensure proper communication.

F. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.

G. Adjust time delay so that controlled area remains lighted while occupied.

H. Provide written or computer-generated documentation on the configuration of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.

2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)

3. Load Parameters (e.g. blink warning, etc.)

I. Post start-up tuning – After 30 days from occupancy contractor shall adjust sensor time delays and sensitivities to meet the Owner's requirements. Provide a detailed report to the Architect / Owner of post start-up activity.

J. Network daylight sensors for automatic dimming within a daylit zone shall be calibrated such that lighting power for the lighting fixtures within that daylit zone shall be reduced by 65% when daylit illuminance is 150% of design illuminance. Design illuminance for specific spaces shall be as recommended by the IESNA Lighting Handbook 8th Edition Chapter 11, Figure 11-1, for Commercial, Institutional, Residential, and Public Assembly Interiors.

K. Program uniform manual dimming and ON-OFF control within each space that has a network daylight sensor:

1. Lighting fixtures located within daylit zones shall be programmed to manually turn ON and OFF with lighting fixtures located outside of the daylit zones (in the same space) with a common ON/OFF button.

2. Lighting fixtures located within daylit zones shall be programmed to manually dim at the same rate as lighting fixtures outside of the daylit zone (in the same space) once lighting fixtures outside of the daylit zone have had lighting power manually reduced by 65%.

L. Program four-scene network dimming manual control stations as follows:

1. ENERGY SAVER (Scene 1): Selection of the "ENERGY SAVER" scene shall uniformly lower the lighting levels of all lighting fixtures within the space to 85-percent of their maximum lighting power demand (emulates demand response at local zone level).

2. A/V (Scene 2): Selection of the "A/V" scene shall turn OFF lighting fixtures in zones with lighting fixtures located in front of a projection screens or video monitors and shall reduce all other zones within the space to 20-percent of maximum light output.

3. DIM-50% (Scene 3): Selection of the "DIM-50%" scene shall uniformly lower the lighting levels of all lighting fixtures within the space to 50-percent of maximum light output.

4. DIM-5% (Scene 4): Selection of the "DIM-5%" scene shall uniformly lower the lighting levels of all lighting fixtures within the space to 5-percent of maximum light output.

5. Dimming manual control station shall include ON/OFF control.

M. Lighting controls shall be connected and programmed to be demand responsive and shall automatically reduce building lighting power demand by 15% in response to a demand response signal per 2022 CA Energy Code section 130.1 (e).

3.3 FACTORY SERVICES

A. Upon completion of the installation, a manufacturer's factory authorized representative shall start up and verify a complete and fully functional system.

B. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

3.4 ACCEPTANCE TESTING AND COMMISSIONING

A. The Contractor shall provide the services of a California State certified lighting controls acceptance test technician (CLCATT) to act as the acceptance testing agent and verify the installation of the lighting control systems.

B. Provide the services of a manufacturer’s factory technician time to assist the CLCATT review the functionality and settings of the lighting control hardware per the requirements in the California State forms.

C. The Contractor shall provide the services of a Commissioning Agent to provide commissioning of the indoor and outdoor lighting systems. The following commission tasks shall be completed in accordance with 2022 California Energy Code, Section 120.8 Building Commissioning:

1. The Commissioning Agent shall obtain the Owner’s Project Requirements.
2. The Commissioning Agent shall compile and update a Basis of Design during the construction of the project.
3. The Commissioning Agent shall complete a commissioning plan including the following information:
    a. General project information
    b. Commissioning goals
    c. Systems to be commissioned
    d. Plans to test systems and components, which shall include:
        1) An explanation of the original design intent
        2) Equipment and systems to be tested, including the extent of the tests
        3) Functions to be tested
        4) Conditions under which the test shall be performed
        5) Measurable criteria for acceptable performance
        6) Commissioning team information

7) Commission process activities, schedules and responsibilities

4. The Commissioning Agent shall provide function performance testing.

5. The Commissioning Agent shall provide system documentation and training requirements.

6. The Commissioning Agent shall provide a commissioning report.

3.5 TITLE 24 - PART 6 DOCUMENTATION OF INSTALLATION AND ACCEPTANCE FOR INDOOR AND OUTDOOR LIGHTING

A. The Contractor shall prepare and submit the following Certificates of Installation:

1. Indoor Lighting:
   a. Certificate of Installation – Validation of Certificate of Compliance (NRCI-LTI-01-E)
   b. Certificate of Installation – Energy Management Control System or Lighting Control System (NRCI-LTI-02-E)
   c. Certificate of Installation – Line-Voltage Track Lighting (NRCI-LTI-03-E)
   d. Certificate of Installation – Two Interlocked Lighting Systems (NRCI-LTI-04-E)
   e. Certificate of Installation – Power Adjustment Factors (NRCI-LTI-05-E)
   f. Certificate of Installation – Additional Videoconference Studio Lighting (NRCI-LTI-06-E)
2. Outdoor Lighting:
   a. Certificate of Installation – Outdoor Lighting (NRCI-LTO-01-E)
   b. Certificate of Installation – EMCS – Lighting Control System (NRCI-LTO-02-E)
3. Sign Lighting:
   a. Certificate of Installation – Sign Lighting (NRCI-LTS-01-E)

B. The Contractor shall provide the services of a California state certified lighting controls acceptance test technician (CLCATT) to perform acceptance tests, prepare Certificates of Acceptance and certify that all indoor and outdoor lighting systems comply with the 2022 California Energy Code Section 130.4. The Certificates of Acceptance shall bear the name and certification identification number of the certified lighting compliance acceptance test technician. The certified lighting compliance acceptance test technician shall prepare and submit the following Certificates of Acceptance:

1. Indoor Lighting:
   a. Certificate of Acceptance – Lighting Controls (NRCA-LTI-02-A)
   b. Certificate of Acceptance – Automatic Daylighting (NRCA-LTI-03-A)

c. Certificate of Acceptance – Demand Responsive Lighting Controls (NRCA-LTI-04-A)

2. Outdoor Lighting:

a. Certificate of Acceptance – Outdoor Motion Sensor and Lighting Shut-off Controls (NRCA-LTO-02-A)

C. The Contractor shall properly calibrate all lighting control devices and systems. To verify that the lighting control devices and systems have been properly calibrated the Contractor shall conduct tests referred to in Chapter 13 of the 2022 California Energy Commission Nonresidential Compliance Manual and required by 2022 California Energy Code Article 130.4. The Contractor shall test and make modifications to the control until it passes the test in accordance with the following Reference Non-Residential Appendices:

1. Indoor Lighting:

a. NA7.6.1 Automatic Daylighting Controls Acceptance

b. NA7.6.2 Shutoff Controls Acceptance

c. NA7.6.3 Demand Responsive Lighting Controls Acceptance

d. NA7.6.5 Demand Responsive Controls for Controlled Receptacles Acceptance

2. Outdoor Lighting

a. NA7.8 Outdoor Lighting Controls

3.6 ON-SITE ASSISTANCE

A. Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes, and adjust sensors and controls to suit actual conditions.

3.7 PERSONNEL TRAINING

A. Train Owner's building personnel in procedures for starting-up, testing and operating lighting control system equipment.

END OF SECTION 266100

SECTION 269500
ELECTRICAL ACCEPTANCE TESTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section defines the Electrical Acceptance Tests and checks that shall be made on all electrical equipment and wiring to ensure compliance with all applicable Codes and Standards, and with the requirements of the Contract Documents.

B. All electrical equipment testing and related costs shall be included in the Contractor's bid.

1.2 GENERAL REQUIREMENTS

A. The Contractor shall test equipment of all kinds installed on this project to determine whether it fulfills the requirements of these Specifications. The Contractor shall furnish all labor necessary to adjust the operation of the apparatus and make the connections for the tests. After the tests have been completed, the Contractor shall restore all connections, apparatus, etc., to their original condition.

B. The Contractor shall retain the services of a qualified Independent Testing Agency holding a valid current C-10 License to perform **certain** tests and prepare reports, as enumerated in the following Articles. The Independent Testing Agency shall be a company that specializes in electrical equipment testing and shall be NETA or NICET certified.

C. The contractor shall obtain approval from the architect of proposed independent testing agency(s) before any testing is started.

D. Electrical systems, equipment and materials shall be tested prior to final acceptance of the work.

1.3 INDEPENDENT TESTING AGENCY REQUIREMENTS

A. The Independent Testing Agency shall furnish personnel acceptable to Engineer to conduct testing. Supervising engineer shall have a minimum of five years' experience in testing of equipment of the type to be tested on this Project.

B. The Independent Testing Agency shall furnish all labor required for and incidental to testing.

C. The Independent Testing Agency shall provide minor field repairs, adjustments, and wiring modifications at the time of inspection and testing.

D. The Independent Testing Agency shall furnish all necessary test equipment to satisfactorily perform all tests specified herein.

E. The Independent Testing Agency shall check all devices for proper operation - checking for wear, tightness, dirt, etc.

F. The Independent Testing Agency shall check for conformance to published curves.

G. The Independent Testing Agency shall notify and coordinate with the Owner's representative at least 3 working days prior to the commencement of any Electrical Acceptance Testing. Tests shall be witnessed by the Owner's representative unless such witnessing is waived in writing by the Owner's Representative.

1.4 CODES AND STANDARDS

A. 2022 California Electrical Code (CEC).

B. National Electrical Manufacturer's Association (NEMA).

C. Manufacturer's Instructions and Maintenance Manual applicable to each particular apparatus.

D. OSHA Rules and Regulation.

E. National Electrical Testing Association (NETA) "Acceptance Testing Specifications".

F. Procedures as directed by Engineer.

1.5 CARE AND PRECAUTIONS

A. Contractor shall be responsible for any damage to equipment or material due to improper test procedures or test apparatus handling, and shall replace or restore to original condition, any damaged equipment or material.

B. Contractor shall furnish and use safety devices such as rubber gloves and blankets, protective screens, barriers, and danger signs to adequately protect and warn all personnel in the vicinity of the tests.

1.6 EQUIPMENT TO BE TESTED BY CONTRACTOR

A. Perform the visual inspections, manual operations and tests on systems and equipment as described in Part 3, "Execution".

B. Engine-Generator Set

C. Substation Primary Switch

D. Medium Voltage (Primary) Cable

E. Substation Transformer

F. Secondary Switchgear

G. Switchboard

H. Molded Case Circuit Breakers Rated Less Than 100A

I. Power Cable

J. Distribution Transformers

K. Service, Distribution and Motor Control Equipment

L. Disconnect Switches

M. Motors

N. Lighting

O. Title 24 Acceptance Testing

P. Heat Tracing Cables and Mats

Q. Control Cable

R. Fire Alarm System

S. Intercommunications, Clock, and Program System

T. Video Distribution System

U. Special Systems

V. Communication System

1.7 EQUIPMENT TO BE TESTED BY INDEPENDENT TESTING AGENCY

A. Circuit Breakers Rated 100A and Greater

B. Grounding System

C. Switchboards and Panels

1.8 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. Test Reports

1. Provide written test reports, signed and dated, for all tests prior to acceptance of the tested equipment by the Owner.

2. All tests shall be recorded on the following forms:

a. 269500 - 1 MULTIPLE CONDUCTOR CABLE MEGGER TEST, 300V AND LESS

b. 269500 - 2 SINGLE & MULTIPLE CONDUCTOR POWER CABLE MEGGER TEST, 600V AND LESS

3. Submit certified reports of Independent Tests and Observations indicating and interpreting test results specified in Part 3 of this Section.

   a. The Test Report shall include the following:

      1) Description of equipment tested.

      2) Description of test procedure.

      3) Calibration record for all testing devices used.

      4) Test results.

      5) Recommendations.

      6) Appendix, including all field test reports.

   b. Furnish six copies of completed report to the Electrical Engineer no later than ten days after test completion unless requested otherwise by Owner.

   c. Instrumentation-Traceability: The testing agency shall provide calibration labels for all relays and circuit breakers tested.

   d. Labels shall be self-adhesive and placed on covers or frames so as not to obscure nameplate, tap block or time dial. Label shall indicate date tested and firm name.

PART 2 - PRODUCTS

2.1 TESTING EQUIPMENT

A. Furnish suitable electrical instruments including voltmeters, ammeters, wattmeters, tachometers and all other equipment necessary to perform tests specified.

B. Make necessary openings in circuits for testing instruments and place and connect all instruments, equipment and devices necessary for the tests. Upon completion of tests, remove instruments and instrument connections and restore all circuits to permanent condition.

2.2 TESTING COORDINATION

A. Coordinate activities and cooperate with others on the Project to ensure that systems are energized when required, when loads are applied, and that other requirements of this Section of the Specifications are carried out in a timely, coordinated basis.

B. Conduct tests in the presence of the Construction Manager. Notify the Construction Manager seven calendar days or more in advance when any test is to be performed, and do not start tests without the permission of the Construction Manager.

C. Make up no permanent connections until correct phase sequence of all equipment is determined.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall provide Acceptance Testing on the entire Electrical System. Certain of this testing shall be performed by an Independent Testing Agency as indicated.

B. Acceptance Testing shall include Visual Inspections, Manual Operations, Electrical Tests, and Functional Testing.

C. Whenever possible, all Visual Inspections, Manual Operations and Electrical Tests shall be made just prior to energizing the equipment or circuits, and shall be coordinated with the field schedule and field conditions.

D. Test reports on megger, dielectric absorption and high potential tests shall include the ambient temperature and relative humidity existing at the time of the tests.

E. Should any piece of apparatus or any material or work fail during any of these Tests, it shall be immediately removed and be replaced by perfect material by this Contractor at his expense and the portion of the work replaced be again tested by the Contractor.

F. Before testing and energizing a system, all necessary precautions shall be taken to ensure the safety of personnel and equipment. All conductors and all electrical equipment shall be properly insulated and enclosed. All enclosures for conductors and equipment shall be properly grounded. Insulation resistance measurements must have been made and approved on all conductors and energized parts of electrical equipment.

1. During actual testing, the Contractor or Independent Testing Agency shall:

    a. Ensure that temporary power terminations are connected in such a manner that commercial power may be restored in forty-five minutes upon request.

    b. Place temporary power cables out of the way in a safe manner that provides no hazard to personnel or equipment in the area.

    c. Provide all special connections required.

    d. Conduct all tests in presence of the representative except where advised this would not be necessary.

G. The entire installation shall be free from short circuits and improper grounds. Panels and circuits shall be tested for grounds and shorts with mains disconnected from the feeder, branches connected, lamps removed or omitted from the sockets and all wall switches closed. Each individual circuit shall be tested at the panel with the equipment connected for proper operation

H. The following minimum tests are required, but shall not be limited to this list. Tests will be supervised and witnessed by the Construction Manager:

1. Proper phase rotation.

2. Short circuits.

3. Improper grounds.

4. Power and control electrical circuits for circuit continuity and function test.

I. Furnish all personnel, labor, meters, instruments, cable, connections, equipment and apparatus necessary for making all tests.

J. Check and test all switchboards, transformers, panelboards, feeders, power and control cables, communication system devices and wiring, and all connections to all equipment.

K. After wires and cables are in place and connected to devices and equipment, the system shall be tested for short circuits, improper grounds, and other faults. If fault condition is present, the trouble shall be rectified and the wiring system shall be retested.

L. A voltage test shall be made at each lighting panel, distribution panel and at the last outlet on each circuit. If drop in potential exceeds one percent, correct the condition by locating the ground or high resistance splice or connection and retest.

M. Any wiring device, electrical apparatus, or lighting fixture grounded or shorted on any integral "live" part, shall be removed and the trouble rectified by replacing the defective parts or materials.

N. All final tests shall be witnessed by the Construction Manager and three copies of the verified test results shall be given to the Architect/Engineer and Construction Manager promptly upon completion of a test.

O. Provide assistance to the various equipment manufacturers' field engineers as required in the testing and adjusting of the electrical power and control equipment. Cooperation shall be such that a minimum of time is required for equipment testing.

P. A log shall be maintained for all tests. This log shall be certified before completion of the project, both as to test value and date of test. All major equipment such as the switchboard and panelboards shall be energized initially in the presence of the Construction Manager.

Q. The Owner reserves the right to operate any system or equipment prior to final completion and acceptance of the work. Such preliminary operation shall not be construed as an acceptance of any work. Each piece of equipment and all of the systems shall be adjusted to insure proper functioning and shall be left in first class operating condition.

3.2 VISUAL INSPECTIONS

A. Prior to Manual Operation and Electrical Testing, perform Visual Inspections to verify the following:

1. The equipment is completely and properly installed.
2. The equipment is free from damage and defects.
3. Shipping blocks and restraints have been removed.
4. Electrical terminations have been properly tightened.
5. The equipment has been properly aligned.
6. The equipment has been properly lubricated.
7. The ventilation louvers are open and unobstructed.
8. Voltages and phases have been properly identified.
9. Terminations in control panels have been properly identified.
10. The equipment is ready to be tested

3.3 MANUAL OPERATION

A. Prior to any Electrical Testing, mechanical devices shall be exercised or rotated manually to verify that they operate properly and freely.

3.4 ELECTRICAL TESTS BY CONTRACTOR

A. Engine-Generator System

1. Perform a continuity check and 1,000 volt DC megger test on the generator windings, generator circuit breaker, power circuit portions of the automatic transfer switch, and interconnecting power circuit wiring.
2. Perform a continuity check on the control wiring.
3. Calibrate the metering and time delay relays.
4. Perform the normal start-up testing recommended by the engine-generator manufacturer.
5. Perform a load bank test of overall system with a load bank rated at 80% minimum (100% preferred) for a period of at least thirty (30) minutes.
    a. Open normal power to transfer switch and observe proper operation of engine-generator and automatic transfer switch (throwing over to emergency power), noting engine-generator start, time delays and other appropriate variables.

b. Close normal power and observe proper transfer back to normal and proper shutdown of engine-generator, again noting time delays and other appropriate variables.

c. Operate maintenance bypass switch to insure proper labeling and operation in all modes

6. Test for proper operation of annunciator panel, fire alarm connections, security/monitoring system connections, and accessories under all conditions.

B. Substation Primary Switch

1. Perform a continuity check, 2,500-volt DC megger test, and a 21kV AC high potential test on primary switches.

C. Medium Voltage (Primary) Cable

1. Perform a continuity test, 2,500-volt DC megger test, AC high potential test, and a second 2,500-volt DC megger test on primary cables. The high potential test shall be performed at 45kV (or 80 percent of the factory DC test voltage, whichever is higher) for new cable installations and at 30kV when new cable has been spliced to existing cable.

2. Do not perform more than one high potential test on any item without authorization from the Owner's Representative.

3. Direct-current voltage shall be applied on each phase conductor of the system by connecting conductors as one terminal and connecting grounds and metallic shields or sheaths of the cable as the other terminal for each test.

4. Prior to making the test, the cables shall be isolated by opening applicable protective devices and disconnecting equipment. The method, voltage, length of time, and other characteristics of the test shall be in accordance with the cable manufacturer's recommendations for the particular type of cable installed, and shall not exceed the recommendations of IEEE No. 404 for cable joints (and IEEE No. 48 for cable terminations) unless the cable and accessory manufacturers indicate higher voltages are acceptable for testing.

5. Should any cable fail due to a weakness of conductor insulation or due to defects or injuries incidental to the installation or because of improper installation of cable, cable joints, terminations, or other connections, the Contractor shall make necessary repairs or replace cables as directed.

6. A test report shall be submitted to the Engineer for approval prior to energizing.

D. Substation Transformer

1. Perform a DC megger test and a turns-ratio test on unit substation transformers. The DC megger test shall be performed at 2,500 volts on coils rated over 600 volts, and at 1,000 volts on coils rated 600 volts and below. The turns-ratio test shall be performed on each tap.

E. Secondary Switchgear

1. Perform a continuity check and 1,000 volt DC megger test on buses, and on main and feeder breakers.

2. Perform a primary current injection test and a 'Ducter' (contact resistance) test on main breakers.

3. Perform a 1,000-volt DC megger test and a turns-ratio test on CT's and PT's.

4. Calibrate the metering.

F. Switchboard

1. The Contractor shall perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification, Sections 7.1, 7.6, 7.9, 7.10, 7.11, and 7.14, as appropriate. Certify compliance with test parameters.

2. Switchboard and completed installation shall be inspected for adequate size, bus spacing, bracing, physical damage, proper alignment, anchorage and grounding.

3. Switchboard frame will be inspected for alignment, level, and anchorage.

4. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer’s recommended torque value. All bus bolts will be torqued to their proper value. A mark to be placed on each tightened bolt to ensure completeness.

5. Switchboard interior will be vacuumed and wiped clean.

6. The following tests and checks shall be performed before placing in operation:

   a. Check all new bus and cable connections for proper contact pressure and mark each bolt with a red “dot” of paint to indicate it has been checked.

   b. Check all the new equipment for mechanical adjustment, lubrication, and freedom of operation. Remove all shipping blocks.

   c. Operate and test trip units for all new breakers.

   d. Test all transfer switches and associated control circuits for correct connection and operation.

   e. Test all panel feeders and main breakers.

   f. Test ground fault systems by operating push-to-test button.

   g. Physically test key interlock systems to check for proper functionality.

7. Using a Megger, measure the insulation resistance of each bus section phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000VDC. Minimum acceptable value for insulation resistance is one (1) megohm. Refer to manufacturer’s literature for specific testing procedure.

G. Molded Case Circuit Breakers rated less than 100A

1. Circuit breakers will be operated manually several times to ensure smooth operation.

2. Molded case will be inspected for cracks.

3. Rated current will be passed through each phase and millivolt readings taken across contacts.

4. Time current characteristic tests will be performed by passing 300% rated current through each phase and monitoring trip time.

5. Instantaneous pickup current will be determined by finding the current level at which the breaker trips out in less than 2 cycles.

6. Insulation resistance tests will be performed at 1000 Volts DC.

7. Circuit breaker covers will be removed on unsealed units and checked for cracks. Interphase barriers and arc chutes to be inspected. All bolts and lugs will be tightened. All internal auxiliary devices will be inspected.

8. Contacts, shunts, etc., will be visually inspected for wear and alignment.

9. Inverse trip time, instantaneous pickup current and millivolt drop across contacts, insulation resistance values, as well as deficiencies causing breaker to function outside published limits will be recorded. Times will then be compared with manufacturer's or NEMA published values.

H. Power Cable

1. The 600-volt insulated wires and cables shall be factory tested prior to shipment in accordance with ICEA Standards for the insulation specified.

2. Perform a continuity check and a 1,000 volt DC megger test on 600 volt power cables No. 6 AWG and larger.

   a. The megger test shall be performed between each pair of conductors and from each conductor to ground.

   b. The megger test shall be performed for 15 seconds or until the insulation resistance value stabilizes.

   c. The insulation resistance between conductors and from each conductor to ground shall be 100 megohms minimum in one minute or less. In addition, the lowest insulation resistance value shall not differ from the highest value by more than 20 percent.

3. Phase conductors, if shorted, grounded or at fault shall be removed, shall be replaced and the wiring system shall be retested.

I. Distribution Transformers

1. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 2.5 percent. Submit recording and tap settings as test results.

2. Adjust buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

3. Prepare a written Output Settings Report recording output voltages and tap settings.

J. Service, Distribution and Motor Control Equipment

1. Megger tests shall be performed at a DC voltage of 1,000 volts for 600 volt rated equipment, and at 500 volts for 120-300 volt rated equipment.

2. Perform a 1,000-volt megger test on buses, motor starters and disconnect switches. This test may be combined with the feeder cable megger test by testing the devices and terminated cables together.

3. Perform a continuity check on motor control circuits and control panel internal wiring.

4. Perform an operational test on the controls.

5. Perform a continuity check and a 1,000-volt DC megger test on 3 phase distribution and isolation transformers.

K. Disconnect Switches

1. Check for cleanliness of contacts, operation, etc.

2. Lubricate contacts and mechanical devices.

3. Check fuse-clip tightness.

4. Perform a 1,000-volt megger test on disconnect switches rated for 600V and at 500 volts for disconnect switches rated for 240V.

L. Motors

1. Perform a 1,000-volt megger test on 460 volt, 3 phase motors, and a 500 volt megger test on 200-230 volt, 3 phase motors.

2. “Bump” motors to verify proper direction of rotation.

3. Run motors and check for vibration and overheating.

M. Lighting

1. Upon completion of installation of lighting fixtures and controls, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. The Contractor shall replace at his expense all noisy ballasts, broken or cracked lenses or other defective items. Where possible, correct malfunctioning units at site, then re-test to demonstrate compliance; otherwise, remove and replace with new units, and proceed with re-testing.

2. At the time of substantial completion, replace lamps in interior lighting fixtures, which are observed to be noticeably dimmed after Contractor’s use and testing, as judged by Architect or Electrical Engineer.

3. Replace defective and burned out LED fixtures for a period of one-year following the time of substantial completion.

4. Give advance notice of dates and times for field tests.

5. Provide instruments to make and record test results.

6. Tests and Observations

    a. Verify normal operation of lighting units after installing fixtures and energizing circuits with normal power source.

    b. Check for excessively noisy ballasts.

    c. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following information in tests of emergency lighting equipment:

        1) Duration of supply

        2) Low battery voltage shutdown.

        3) Normal transfer to battery source and retransfer to normal.

        4) Low supply voltage transfer.

        5) Report results of tests in wiring.

N. Title 24 Acceptance Testing

1. Perform tests as outlined in Part 3 of Specification Section 266100.

O. Heat Tracing Cables and Mats

1. Perform a continuity check, 500-volt DC megger test and an operational test on heat tracing circuits prior to insulation of the pipe or tank. Verify proper current draw and heating of the heat tracing.

2. Perform an operational test on the alarms as applicable

P. Control Cable

1. Perform a continuity check on control and instrumentation wiring.

Q. Fire Alarm System

1. Perform testing in accordance with NFPA 72-2022.

R. Intercommunications, Clock, and Program System

1. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components, perform the initial system programming, and oversee the pre-testing, testing and adjustment of the system.

2. Programming: Fully brief the Owner on programming options available for the system. Record his programming decisions and set up the initial programming of the system. Set system so signal devices operate on required schedules and are

activated for durations selected by the Owner. Program relay output circuits to suit Owner's operating schedule for the equipment controlled. Provide the Owner with a written record of the decisions, implementation methodology, and final results.

3. Test Procedure: Conform to the following:

   a. Schedule tests a minimum of 7 days in advance of performance of tests.

   b. Report: Submit a written record of inspection and test results.

   c. Operational Test: Perform operational system test to verify conformance of system to these Specifications. Perform tests that include originating station-to-station, all-call, and page messages at each intercommunication station. Verify proper routing and volume levels and freedom from noise and distortion. Test each available message path from each station on the system. Include operation of all modes of clock correction and all programming and manually programmed signal and relay operating functions.

   d. Frequency Response Test: Determine frequency response of 2 transmission paths, including all-call and paging by transmitting and recording audio tones. The minimum acceptable performance is within 3 dB from 150 to 2500 Hz.

   e. Signal-to-Noise Ratio Test: Measure the ratio of signal to noise of the complete system at normal gain settings, using the following procedure:

      1) Disconnect a speaker microphone and replace it in the circuit with a signal generator using a 1000-Hz signal. Measure the ratio of signal to noise.

      2) Repeat the test for 4 speaker microphones and for each separately controlled zone of paging loudspeakers.

      3) The minimum acceptable ratio is 35 dB.

   f. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 150, 200, 400, 1000, and 2500 Hz into each paging and all-call amplifier, and a minimum of 2 selected intercommunication amplifiers, and for each frequency, measure the distortion in the paging and all-call amplifier outputs. The maximum acceptable distortion at any frequency is 5 percent total harmonics.

   g. Acoustic Coverage Test: Feed pink noise into the system using octaves centered at 500 and 4000 Hz. Use a sound-level meter with octave band filters to measure the level at 3 locations in each paging zone. The maximum permissible variation in level is plus or minus 3 dB, and the levels between adjacent zones must not vary more than plus or minus 5 dB.

   h. Power Output Test: Measure the electrical power output of each paging amplifier at normal gain setting at 150, 1000, and 2500 Hz. The maximum variation in power output at these frequencies must not exceed plus or minus 3 dB.

i. Signal Ground Test: Measure and report ground resistance at the system signal ground. Conform to the testing requirements of Division 26 Section "Grounding."

4. Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards. Provide a written record of all retest results.

5. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

S. Video Distribution System

1. System shall be tested to measure Forward and Return characteristics.

2. Contractor shall provide stable signal sources at the channel frequencies to be measured. Off-air signals are not considered a “stable” signal.

3. Forward Testing

a. Using a digital field strength meter, the contractor shall measure and record the Visual Signal Level (Visual Carrier) at each Tap/TV Outlet in the system.

1) Measurements shall be made at:

2) Channel 2 (approximately 54 MHz)

3) Channel 117 (approximately 750 MHz)

4) Record the level readings on the “as built” drawings.

b. Signal level at every Tap/TV Outlet shall be +10 dBmv, +, -5 dB.

c. Visual tests shall be performed to check for effects of Noise, Undesirable Modulation Components, Ghosting, Ringing, R.F. Beats, and Color Hue Changes.

d. There shall be no noticeable difference between a picture viewed at the headend and the same picture viewed at any outlet in the system.

e. Visual Tests shall be made by viewing each of the Channels distributed by the system, when connected to existing Cable Company drop.

f. Additional visual test shall be made using Channel 5 operating with an unmodulated carrier. The effects noted in #3 above shall be checked.

g. #3 through #6 shall be performed at one Tap/Outlet at each WC location (output of remote amplifier).

4. Reverse Testing

a. Using a digital field strength meter, the contractor shall measure and record the return signal level at the input and output of the Agile Processor, located at the Head End.

1) Measurement shall be made at sub-channel T9 (approx. 19 MHz).

2) The input level shall be within the range specified by the manufacturer of the Agile Processor.

3) The output level shall be compatible with the needs of the Head End Trunk Amplifiers.

4) Return signal shall be injected at the last tap of each feeder.

5. Testing Head End

a. All components of the Head End shall be installed and adjusted to provide the system quality as described in Article 3.3, Paragraphs A., B., and C. above.

b. The Contractor shall measure and record Ch. 2, Ch. 117, and Sub-Ch. T-9 levels at all major points in the Head End system.

c. Recorded signal levels shall be entered on the “as-built” drawings.

T. Special Systems

1. Security systems, sound reinforcement systems, and other special systems shall be tested in accordance with test plans submitted by their manufacturers and approved by the Owner. These test plans shall verify compliance with Specifications and proper operation including all inputs, outputs and accessories under all modes of operation.

U. Communication System

1. Refer to Division 27 Sections of these Specifications for testing.

3.5 INDEPENDENT AGENCY TESTING

A. Circuit Breakers rated 100A or greater

1. All circuit breakers, 100 amps or more, shall be tested by an independent testing agency in accordance with NETA specifications and a report submitted to the architect. Any circuit breaker that does not pass the test shall be replaced.

2. Circuit breakers will be operated manually several times to ensure smooth operation.

3. Molded case will be inspected for cracks.

4. Rated current will be passed through each phase and millivolt readings taken across contacts.

5. Time current characteristic tests will be performed by passing 300% rated current through each phase and monitoring trip time.

6. Instantaneous pickup current will be determined by finding the current level at which the breaker trips out in less than 2 cycles.

7. Insulation resistance tests will be performed at 1000 Volts DC.

8. Circuit breaker covers will be removed on unsealed units and checked for cracks. Interphase barriers and arc chutes to be inspected. All bolts and lugs will be tightened. All internal auxiliary devices will be inspected.

9. Contacts, shunts, etc., will be visually inspected for wear and alignment.

10. Inverse trip time, instantaneous pickup current and millivolt drop across contacts, insulation resistance values, as well as deficiencies causing breaker to function outside published limits will be recorded. Times will then be compared with manufacturer's or NEMA published values.

11. The testing agency shall provide calibration labels for all relays and circuit breakers tested. Labels shall be self-adhesive and placed on covers or frames so as not to obscure nameplate, tap block or time dial. Label shall indicate date tested and firm name.

B. Grounding System

1. Test shall be performed for every new **SEPARATELLY DERIVED AC SYSTEM.**

2. Ground tests shall meet the requirements of the California Electrical Code and comply with UL 467. The grounding electrode system at the main electrical service equipment shall be tested by an Independent Testing Agency in accordance with the three point fall of potential method as specified in IEEE Standard 81-1983. Maximum ground resistance shall be 5 OHMS. A copy of the test report shall be submitted to the architect and engineer of record.

3. Maximum grounding to resistance values are as follows:

   a. Equipment Rated 500 kVA and Less: 5 ohms.

   b. Equipment Rated 500 to 1000 kVA: 5 ohms.

   c. Equipment Rated More than 1000 kVA: 3 ohms.

4. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than 2 full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method according to IEEE 81.

5. The test agency shall remove the test link between the ground and neutral, and test the neutral for any parallel and/or superfluous ground paths. If any are found, a report should be given to the Engineer. No grounds are to be removed unless authorized in writing.

6. Ground electrode resistance shall be taken using a Biddle ground resistance meter and readings given to the report.

7. All ground connections in switchboard as well as that to cold water pipes shall be check for tightness and adequacy.

8. Measure the resistance to ground of each ground rod [in a ground mat] before connection to the other ground rods. The resistance shall not exceed 10 ohms.

9. Measure the resistance to ground of the total ground system with all connections completed. The resistance shall not exceed 2 ohms for primary services or 5 ohms for secondary services.

10. Tests of the resistance to ground shall be made using either the three point method or the fall-of-potential method.

11. Perform a continuity check from equipment ground bus bars and ground lugs to the ground system.

12. Ground rods for manholes and light poles need not be tested.

13. Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify Owner promptly and include recommendations to reduce ground resistance and to accomplish recommended work.

14. Report: Prepare test reports, certified by the testing organization, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Switchboards and Panels

1. The Independent Testing Agency shall perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification, Sections 7.1, 7.6, 7.9, 7.10, 7.11, and 7.14, as appropriate. Certify compliance with test parameters.

2. After Substantial Completion, but not more than 2 months after Final Acceptance, The Independent Testing Agency shall perform an infrared scan of each switchboard and panel.

   a. Remove fronts to make joints and connections accessible to a portable scanner.

   b. Use an approved infrared-scanning device designed to measure temperature or detect significant deviations from normal values.

   c. Provide calibration record for device used.

   d. Prepare a certified report identifying switchboards and panels checked and describing results of infrared scanning. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

3.6 FUNCTIONAL TESTING

A. All automatic and manual functions shall be checked for proper operation.

B. All indicating circuits, lights and alarms shall be tested for correct operation. Burned out indicators shall be re-lamped.

C. Upon completion of the Work, place the entire installation in operation, test for proper function, and show systems and equipment to be free of defects.

END OF SECTION 269500

FORM 269500 – 1

MULTIPLE CONDUCTOR CABLE MEGGER TEST, 300 VOLTS & LESS

WIRING - SIGNAL & COMMUNICATION CABLE

Testing shall be performed before connecting the cables to the terminals at either end. Continuity of each conductor shall be checked at this time. Each conductor shall be checked with a 500 volt megger to ground, with all other conductors in the cable and shield, grounded. The minimum acceptable megger resistance shall be 50 megohms for each conductor to ground.

PROJECT NAME _____

FEEDER NUMBER_____ LOCATION_____

CABLE SIZE _____ CABLE LENGTH_____

NO. OF CONDUCTORS _____ INSULATION TYPE_____

MANUFACTURER _____ LINE VOLTAGE_____

TEMPERATURE _____ HUMIDITY_____

MEGGER TYPE _____ SERIAL NUMBER_____

TEST VOLTAGE _____ MULTIPLIER_____

REMARKS_____

CONDUCTOR NO.	MEGOHMS		CONTINUITY		CONDUCTOR NO.	MEGOHMS		CONTINUITY	
	C/C	C/S	PASS	FAIL		C/C	C/S	PASS	FAIL

TEST PERFORMED BY_____ _____

Signature Date

TEST WITNESSED BY_____ _____

Signature Date

FORM 269500 – 2

SINGLE & MULTIPLE CONDUCTOR POWER CABLE MEGGER TEST, 600 VOLTS & LESS

WIRING – FEEDER CIRCUITS

Testing shall be performed before connecting the cables to the terminals at either end. Continuity of each conductor shall be checked at this time. Each conductor shall be checked with a 500-volt megger to ground, with all other conductors (including shield) in the conduit or cable grounded. The minimum acceptable megger resistance shall be 50 megohms for each conductor to ground.

PROJECT NAME _____

FEEDER NUMBER_____ LOCATION_____

CABLE SIZE _____ CABLE LENGTH_____

NO. OF CONDUCTORS _____ INSULATION TYPE_____

MANUFACTURER _____ LINE VOLTAGE_____

TEMPERATURE _____ HUMIDITY_____

MEGGER TYPE _____ SERIAL NUMBER_____

TEST VOLTAGE _____ MULTIPLIER_____

REMARKS_____

Cable No	MEGOHMS Phase A	MEGOHMS Phase B	MEGOHMS Phase C

TEST PERFORMED BY_____ _____

Signature Date

TEST WITNESSED BY_____ _____

Signature Date

SECTION 272000
TELECOMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. Provide a complete network telecommunications cabling system including Main Distribution Frame (MDF), Intermediate Distribution Frames (IDF), radial distributed site fiber optic cables (data backbone) between the MDF and each IDF, radial distributed site multi-pair copper cables (voice backbone) between the campus Minimum Point of Entry (MPOE) for the telephone service and a telephone backboard located in each building, a system of horizontal cable links between each buildings outlets and the corresponding building IDF/MDF, patch panels, outlet boxes, conduits and raceways, jack modules for terminating both ends of each cable, and coverplates.

B. The Contractor shall provide termination, testing and certification of each cable.

C. The furnishing of network servers and switches is specifically excluded from this section.

PART 2 - PRODUCTS

2.1 TELECOMMUNICATIONS BACKBOARD

A. Telecommunications Backboard Panels: Plywood, DOC PS 1, Exterior, A-C (A face mounted facing out), 3/4-inch nominal thickness.

1. Finish: Intumescent paint finish; Flame Stop Inc.; Flame Stop IM.
    a. Flame Spread: Zero (0) per ASTM E 84; 30 Minute Test Method of Test of Surface Burning Characteristics of Building Materials.
    b. VOC Content: Not more than 50 g/L.
    c. Applied Thickness: Two coats, each coat applied at a rate of 200 sf/gal.
    d. Color and Gloss: As selected by Architect from manufacturer's full range.
    e. Substrate Primers: Primers approved by intumescent paint manufacturer, where manufacturer recommends use of a primer.
2. Where installed in wire closet, height and width must cover entire wall up to 8 feet above floor, except as otherwise indicated.

2.2 TELECOMMUNICATION CABINETS AND RACKS

A. Main Distribution Frame (MDF)

1. Manufacturer: Hewlett-Packard

2. Model: HP Rack 10000 Series 42U 4-post rack.

3. Dimensions: 24.125”W x 40”D x 79”H

B. Intermediate Distribution Frame (IDF)

1. Manufacturer: Chatsworth Products, Inc.

2. Model: 12419-748; Description: 48” CUBE iT PLUS, black in color with double swing cabinet with 19” wide EIA rack mount and tinted plexiglas front door.

3. Dimensions: 24”W x 30”D x 48”H

4. Equipped with the following accessories:

a. Fan and Filter Kit – Model: 12804-701 + 12805-701, 115-volt, 100CFM

b. Power Strip Surge Protected - Model: 12820-707, 20-amp, 120-volt with NEMA 5-20P cord set with six NEMA 5-20R receptacles.

C. Two-Post Rack

1. Manufacturer: Chatsworth Products, Inc.

2. Model: 55053-703; Description: Free standing, floor supported 7’-0” high x 19” wide EIA standard equipment rack, aluminum with black finish. Include floor anchors, rack spacers, and mounting brackets.

3. Furnish with the following accessories:

a. Double-sided Cable Manager – Model: 13912-703, 80.5” high x 6” wide x 16.6” deep.

b. Power Strip Surge Protected - Model: 12820-707, 20-amp, 120-volt with NEMA 5-20P cord set with six NEMA 5-20R receptacles.

2.3 TELECOMMUNICATION BACKBONE CABLING

A. OSP Rated Copper Cable (Voice Backbone)

1. Materials – 24-gauge, twisted pair, solid conductor, black polyethylene sheath, shielded of corrugated aluminum, 25-pair.

2. Manufacturer - Essex (SEALPIC-F, Type REA PE39) or equal.

B. OSP Rated Optical Fiber Cable (Data Backbone)

1. Materials – Flame–retardant, UV-stabilized, fully water blocked for use in indoor/outdoor applications. Dielectric jacketed 12-strand multimode (62.5um) optical fiber cable. Note: All loose tube cables must be provided with the appropriate fan-out kits to transition from loose tube construction to tight buffered (900 micron) fiber for termination.

2. Manufacturer – Optical Cable Corporation.

C. OSP Rated Optical Fiber Innerduct

1. Materials – 1” corrugated PE type Innerduct with ¼” pre-installed pull rope. Color: orange.

2. Manufacturer – Carlon (type Optic-Gard) or equal.

2.4 TELECOMMUNICATION HORIZONTAL CABLING

A. Horizontal Voice Cable

1. Materials – 23 AWG solid copper UTP, 4-pair, CMP rated, premium Category 6 cable. Color: Grey.

2. Manufacturer – Berk-Tek, Leviton or approved equal.

3. Model: 10167307; Description: type LANmark-2000 series.

B. Horizontal Data Cable - For Workstation Outlets

1. Materials – 23 AWG solid copper UTP, 4-pair, CMP rated, premium Category 6 cable. Color: Blue.

2. Manufacturer – Berk-Tek, Leviton or approved equal.

3. Model: 10163780; Description: type LANmark-2000 series.

C. Horizontal Data Cable – For Wireless Access Points

1. Materials – 23 AWG solid copper UTP, 4-pair, CMP rated, 10-Gigabit Ethernet Category 6A cable. Color: White.

2. Manufacturer – Berk-Tek, Leviton or approved equal.

3. Model: 11082058; Description: type LANmark-XTP series.

D. Horizontal Data Cable – For Connection of Energy Management Systems and Lighting Control Systems to the Local Area Network:

1. Materials – 23 AWG solid copper UTP, 4-pair, CMP rated, premium Category 6 cable. Color: Yellow.

2. Manufacturer – Berk-Tek, Leviton or approved equal.

3. Model: 10167309; Description: type LANmark-2000 series.

E. Cable Tray

1. Ladder Tray –

a. Materials – 24” wide ladder tray with 9” rung spacing. Stringers shall be made from 16 gauge 3/8" x 1 ½” high tensile, tubular steel. The cross members shall be made from 12 gauge steel and feature rolled edges for cable protection. Tray shall be painted rust resistant flat black.

b. Manufacturer – Chatsworth Products, Inc.

2. Wire Basket Tray –

a. Materials – 12” wide x 4” deep stainless steel, AISI 304L or AISI 316L, 2B, finished cold drawn continuous, rigid, welded steel wire basket tray with 2 x 4 inches mesh. Wire basket cable tray will have continuous Safe-T-Edge T-welded top side wire to protect cable insulation and installer. Finish shall be in accordance with ASTM B 380. Splices, supports, and fittings necessary for a complete, continuously grounded system shall be provided.

b. Manufacturer – Wiremold (Cablofil CF 105 Series Wire Cable Tray System) or equal.

F. J Hooks

1. J hook cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed. J hook cable supports shall have flared edges to prevent damage while installing cables. J hook cable supports shall be 1 5/16” minimum and 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. J hook cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.

2. Manufacturer – Erico (Caddy Cablecat Series Non-continuous Support Cable System) or equal.

2.5 TELECOMMUNICATION BACKBONE CABLE TERMINATIONS

A. OSP Rated Copper Cable Termination Blocks (Voice Backbone)

1. Materials – Siemon 66 type punch down block w/50 pair capacity (66M1-50), wall mounted, with 400 pair capacity backboards (Allen Tel P/N 183B2) complete with brackets and cross-connect spools (Allen Tel P/N 187B1). Punch down blocks shall be of high impact flame-retardant thermoplastic, which secure and organize groups of 25 UTP pairs of 22-26 gauge each.

2. Manufacturer – The Siemon Company (66-Type), Allen Tel or equal.

3. Quantity – Provide two (2) termination blocks at each telephone backboard (TBB) + fourteen (14) at the telephone backboard located at the minimum point of entry (MPOE).

B. Copper Cable Protection

1. 100-pair, 66 block input and output, fully loaded with solid state primary telecommunications protector modules, wall mountable.

2. Manufacturer: Circa Telecom model 1890 ECT 1-100 or equal.

C. OSP Rated Optical Fiber Cable Termination Hardware (Data Backbone)

1. Materials – 19” Rack-mountable patch panels, 2U high, with built-in cable management, and smoked Plexiglass removable doors. Complete with universal adapter strips, fully loaded with duplex SC (SC568) type couplings. Panels are to be located at both terminal ends of cabling (MDF and IDF).

2. Manufacturer – The Siemon Company (RIC3 type) or equal.

3. Quantity – Provide one (1) fiber optic cable patch panel in each IDF and one (1) in the MDF.

D. Fiber Optic Connectors

1. Materials – SC-type, with ceramic ferrule, ANSI/TIA/EIA 604-3 compliant

2. Manufacturer – The Siemon Company or equal.

2.6 TELECOMMUNICATION HORIZONTAL CABLE TERMINATIONS

A. Horizontal Voice Cable Termination Blocks (Interconnection to Voice Backbone)

1. Materials – Siemon 66 type punch down block w/50 pair capacity (66M1-50), wall mounted, with 400 pair capacity backboards (Allen Tel P/N 183B2) complete with brackets and cross-connect spools (Allen Tel P/N 187B1). Punch down blocks shall be of high impact flame-retardant thermoplastic, which secure and organize groups of 25 UTP pairs of 22-26 gauge each.

2. Manufacturer – The Siemon Company (66-Type), Allen Tel or equal.

B. Horizontal Data Cable Patch Panels

1. Materials – 48-port, 2U Category 6 patch panel, fully loaded with Mini-com TX6 Jack modules. Rack mountable (19”) w/ integrated rear cable management bar. Color: Black.

2. Manufacturer – Panduit (P/N DP486X88TGY) or equal.

3. Quantity – Provide seven (7) horizontal data cable patch panels in each IDF + seven (7) horizontal data cable patch panels in the MDF.

C. Combination Voice & Data Outlets

1. Station Jack Modules –

a. Voice: Materials – Two (2) 6-position RJ11, Category 3 rated jack modules. USOC wired. Color: Gray. Manufacturer – Panduit (P/N CJ66UIWY) or equal.

b. Data: Materials – Two (2) 8-position RJ45, Category 6 rated jack modules. Color: Blue. Manufacturer – Panduit (P/N CJ6X88TGBU) or equal

2. Outlet Box and Faceplate - Materials - 4 or 6-port, single-gang faceplate shall be mounted to a two-gang outlet box fitted with a single-gang reducer. Blanks shall be installed in each unused port. Panduit Minicom or equal.

D. Data Outlets

1. Station Jack Modules – Materials – 8-position RJ45, Category 6 rated jack modules. Color: Blue. Manufacturer – Panduit (P/N CJ6X88TGBU) or equal. Quantity – Three (3) to six (6) as indicated by symbol subscript.

2. Outlet Box and Faceplate - Materials - 4 or 6-port, single-gang angled faceplate shall be mounted to a two-gang outlet box fitted with a single-gang reducer. Blanks shall be installed in each unused port. Panduit (Mini-com Series 4 or 6 module) or equal.

E. Wireless Access Points

1. Wireless Access Point Connectors – Materials – 8-position RJ45, Category 6A rated plug connector module. Color: Clear. Manufacturer – Panduit (P/N SP6X88-C) or equal. Quantity – One at location of wireless access point.

2.7 LABELS

A. Materials: Vinyl plastic type that meet UL 969 requirements, preprinted or laser printed type, and easily distinguishable.

B. Manufacturers – Panduit, W.H. Brady, Ideal.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. The Contractor shall install all cables, trays, supports, racks, cabinets, frames, backboards, blocks, cable management, connectors, manhole cable rack hardware, and all appropriate termination and mounting hardware.

B. The Contractor shall utilize conduits and cable trays for the placement of voice and data backbone cables.

C. The Contractor shall utilize conduits and cable trays for the placement of horizontal voice and data cables. Cables which exit cable trays shall be supported by J-hooks that are attached to the structure independently from ceiling or lighting fixture supports.

D. Where penetrations through fire rated walls, acoustical or other walls are made for cable pass-thru, such penetrations shall be sealed by the Contractor in compliance with code requirements.

3.2 BONDING AND GROUNDING

A. The Contractor shall provide ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, conduit, cable trays, and framework. All grounds shall consist of #6 AWG stranded copper wire and shall be attached to an

approved building ground, which is bonded to the main electrical ground. Grounding shall be in accordance with J-STD-607-A, NEC, NFPA and all local codes and practices.

3.3 IDENTIFICATION & LABELING

A. The Contractor shall obtain the room numbers that will appear on door signage prior to assigning origin and destination identification for labels.

1. Backbone cables shall be labeled at each endpoint and at all pull boxes, access points or junction boxes. Labels shall indicate origination and destination identification, sheath identification, and strand or pair count.

2. Horizontal cables shall be labeled at each endpoint. Labels shall indicate origination and destination identification.

3. All label printing will be machine generated by system software using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end

3.4 ACCEPTANCE TESTING AND CERTIFICATION

A. All distribution cables shall meet or exceed all performance specifications designated by ANSI/EIA/TIA-568-B.1, and IEEE for telephone and data communications.

B. No later than five days after testing, Contractor shall furnish the Owner with a documentation binder and electronic disks of all test results from OTDR and power meter test equipment. Electronic copies of test results must be presented in format acceptable to the Owner (runtime software application included if necessary). The content requirements for these forms are described in the following sections.

C. Copper Cables: Testing of all copper wiring shall be performed prior to system cut-over. 100 percent of the OSP and horizontal wiring pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage. Test shall include length, mutual capacitance, characteristic impedance, attenuation, and near-end and far end cross-talk. The Contractor, at no charge shall bring any pairs not meeting the requirements of the standard into compliance with the standards and specifications. Complete, end to end test results must be submitted to the Owner. Test results for each of the above tests and associated cable lengths shall be generated by an automated testing device. Test results must be permanently recorded and presented for review in both hardcopy and in a computer-readable format.

D. Fiber Optic Cables - No later than five days after testing, Contractor shall furnish the Owner with a documentation binder and electronic disks of all test results from OTDR and power meter test equipment. Electronic copies of test results must be presented in a readable format (runtime software application included in necessary). The content requirements for these forms are described in the following sections.

1. OTDR Test Results

    a. Contractor shall furnish on disc with application software, electronic strip charts and/or tracer recordings on each and every fiber strand in each and every cable in one direction at both 850 and 1300 nanometer wavelengths for multimode fiber, 1310 and 1550 for singlemode, with the following information:

        1) Date of test
        2) Name of test personnel
        3) Test wavelength
        4) Pulse duration(s) and scale range(s)
        5) Index of refraction
        6) Fiber cable type and part number
        7) Fiber tube and/or fiber strand number
        8) Direction of test
        9) Overall distance in meters
        10) Attenuation in dB or dBm

2. Power Meter Test Results

    a. Contractor shall furnish attenuation assessments for both 850 and 1300 nanometer wavelengths for multimode fiber and 1310 and 1550 for singlemode on each and every fiber in each and every cable, in both directions with the following information:

        1) Date of test
        2) Name of test personnel
        3) Fiber cable type and part number
        4) Fiber number
        5) TX wavelength
        6) TX location
        7) RX location
        8) TX model and serial number
        9) RX model and serial number
        10) Attenuation dB or dBm

3. Contractor may be required to perform additional testing as required by Owner to ensure compliance with mated pair connection loss, splice loss and overall link loss. Any cables failing to meet above indicated standards must be removed and replaced, at no cost to the Owner, with cables, which prove, in testing, to meet the standards. The installation will not be accepted until testing has reported that all pairs meet the appropriate standards.

3.5 PROJECT RECORD DOCUMENTATION

A. The Contractor shall provide a database of cable records, both hard copy and on floppy disk, using Owner approved format (Excel spreadsheet or otherwise specified) for use by the Owner for cable and facilities management. The cable records format must include, at a minimum, the following information about each cable:

1. Distribution Cable Pair Assignments.

2. Test Results.

B. Three (3) sets of reproducible as-built floor plans plus vertical rack elevations and wall mounted termination field details in digital format (AutoCAD or PDF) showing all installed cables, pair and strand assignments, routing, terminal and outlet locations, patch panels and labeling conventions.

C. These documents shall be delivered to the Owner no more than 20 working days after completion and acceptance of the Contractor's work.

END OF SECTION 272000

SECTION 280000
ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

GENERAL

1.01 SUMMARY

A. This project requires the Contractor furnish, label, test, document, and warranty a Card Access Control System, Door Alarm Systems, and Closed-Circuit Surveillance Video System with Video Surveillance IP Cameras in conformance with this specification for the facilities of the Kern Community College District (KCCD) referenced as Porterville College Manzanita Cultural Center.

B. Construction drawings and all provisions of other Contract Divisions, if issued in conjunction with this specification, shall apply to this Division 28 specification. Coordination of work and resolution of conflicts between project documents issued by others such as Architects, Civil Engineers, Electrical/Mechanical Engineers, Plumbing Engineers, Civil Engineers, etc., and this Division 28 specification with its conjoined construction drawings shall be the responsibility of the Contractor.

C. The Contractor shall provide and coordinate the installation of the following:

1. All Access Control readers, Control Panels, Power Supplies, Video Surveillance Systems Components, Cameras, Control Boards, Media Converters, Racks and Housings, Cabling, Monitors, Signal Processing equipment, and all incidental flexible conduit, termination blocks, and building attachments as part of this project and scope.

2. All installation, programming, testing and systems check, including in-service training and one-year parts and labor warranty - See warranty, Division 1 - General Requirements.

3. All Service, Installation and Operations Manuals, Software (mission critical and support), and as-built documentation.

D. All door hardware shall be provided and installed by the Division 08 - Openings contractor. Coordinate door access system connectivity with Division 08 contractor.

E. The list of Division 28 Section specifications that may be included as part of this specification set includes, but is not limited to, the following:

1. Section 28 06 00 – Schedules for Electronic Safety and Security

2. Section 28 13 00 – Access Control Systems

3. Section 28 23 00 – Video Surveillance Systems

4. Section 28 30 00 – Intrusion Detection

F. KCCD Information Technology Team: The KCCD Information Technology Project Manager assigned to this project is the project manager for all aspects of this project and shall be referenced here-in-after as the KCCD Information Technology Project Coordinator (ITPC). At all phases of this project, address all requests for information (RFI), all correspondence, and all required submittals (through the General Contractor, if one is engaged) to the ITPC or his/her designate. If there is a change in the assignment of the ITPC or the ITPC determines a temporary designate, those changes will be given to the contractor in writing.

G. Progress Review Meetings: During the execution phase of this project the selected Contractor shall be prepared to attend progress review meetings with the ITPC or his/her designate.

1.02 QUALITY CONTROL

A. All work shall be performed in a neat and workmanlike manner (also see Division 1 - General Requirements).

B. Product, materials, and equipment provided by the Contractor shall be of the quality specified.

C. All materials furnished under this contract shall be new and of a regularly manufactured line, currently in production at the time of installation.

E. Codes: (Most recent editions with addenda/TSB, etc.) All materials, installation, and workmanship shall comply with the applicable requirements and codes addressed within the following references:

1. National Electrical Manufacturers Association (NEMA).
2. NFPA 70, National Electrical Code (NEC).
3. ANSI/IEEE C2, National Electrical Safety Code (NESC).
4. FCC Rules and Regulations.
5. Local, county, state, and federal regulations and codes in effect as of the bid submission date.

F. Standards: (Most recent editions with addenda/TSB, etc.) All materials, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ANSI C39.1 Electrical Analog Indicating Instruments.
2. NEMA ICS 2 Industrial Control Devices, Controllers and Assemblies.
3. NEMA ICS 6 Enclosures for Industrial Control and Systems.
4. California Electrical Code.
5. NFPA 72 .
6. UL 294 Access Control System Units.
7. UL 796 Printed-Wiring Boards.
8. All products shall be Underwriters Laboratories (UL) listed or other nationally recognized testing laboratory acceptable to KCCD listed for the application intended.

G. Where conflicts exist from one code or standard to another, the code or standard to adhere to will be decided by the ITPC or his/her designate.

1.03 WARRANTIES

The Contractor shall provide a one (1) year material and labor warranty on all the work the Contractor has performed as stipulated in Division 1 - General Requirements.

1.04 MATERIAL SUBSTITUTIONS

A. All requests for substitutions of products shall be made and approved or disallowed during the stated bid period for this project - see Division 01.

B. Three (3) hard copies and a URL reference of all proposed product substitution documentation are required. Proposed product substitution documentation shall contain all the substitution requirements per Division 1 - General Requirements, including the following:

1. The product manufacturer's performance specifications cut sheet(s).

2. If existing, the manufacturer's installation instructions and/or installation recommendations for that product.

C. Acceptance of proposed substitutions is at the discretion of the ITPC. Allow 10 working days for review and final decision.

D. Substitutions must comply with the warranty requirements specified above.

1.05 SUBMITTALS

A. Required submittals upon award of contract, See also Division 1 - General Requirements. These submittals must be received and approved by the ITPC before commencement of work.

1. Proof of Contractor qualifications for access system and camera systems. Include confirmation that the Contractor is certified to provide and install the proposed products as well as the associated warranties.

2. Bill of materials including each part, manufacturer’s part number, brief description, proposed quantities, and reference to the specification section and paragraph where the part is specified.

3 Manufacturers’ cut sheets for all products to be supplied by the Contractor in response to these Division 28 Specification Sections to include manufactures’ installation instructions and recommendations.

4. Field and Shop Drawings including:

a. Overall system schematic diagram and riser drawing diagram.

b. Camera designators.

c. IP addressing - coordinate with the ITPC.

B. Required submittals prior to final acceptance.

1. Two (2) sets of CDs or DVDs of the as-built drawings (AutoCAD or AutoCAD Lite Rev 2014 or later).

2. Two (2) sets of CDs or DVDs of component testing documentation.

3. Two (2) copies of required warranties.

PART 2 - PRODUCTS

2.01 SECTION 28 06 00 - SCHEDULES FOR ELECTRONIC SAFETY AND SECURITY

A. In this specification, product/material shall be specified by reference to the Product/Materials Schedule contained in Section 28 06 00.

B. The Contractor shall supply a complete and functioning system; if a product/material required for this project is not listed in Section 28 06 00 - Schedules for Communications, Products and Materials Schedule, it shall be furnished by Contractor with submittal approval by the ITPC or his/her designate.

C. The Product and Materials Schedule allows for "approved equal" substitutions. When "approved equal" product/material is substituted, the "approved equal" product/material submitted shall be equivalent in every way to the product/material listed in Section 28 06 00 - Schedules for Communications, the Products and Materials Schedule - See Division 1 General Requirements and Material Substitutions above.

2.02 QUANTITIES

Determining quantity of any given required item or product shall be the Contractor's responsibility.

2.03 DEFINITION

In this Division 28 specification, the term "Furnish" shall mean "provide and install."

PART 3 - EXECUTION

3.01 COORDINATION

A. The Contractor shall coordinate the work specified in this Division 28 specification with the work of the other trades involved in this project.

B. The Contractor shall coordinate with Division 26 - Electrical, Division 27 - Communications, and Division 08 - Openings concerning provision and installation of the following:

1. Conduit and cable tray pathway for electronic safety and security system cabling.

2. Wall penetrations and floor coring for electronic safety and security systems pathway.

3. Backboxes for electronic safety and security systems hardware mounting locations.

4. Telecommunications Space and work area space power outlet requirements and placement and requirements for electronic safety and security hardware.

5. Grounding and bonding for electronic safety and security systems.

6. Door latch hardware.

C. All questions and issues regarding coordination and construction element phasing shall be directed to the General Contractor if existing, or the ITPC or his/her designate.

D. The Contractor shall coordinate their work so there shall be no disruption to any occupants of the KCCD building unless coordinated and approved by the ITPC or his/her designate. Any necessary disruption shall be scheduled a minimum of 4 weeks in advance of its occurrence and affected parties shall be notified in writing of date, time, and planned duration of the disruption.

E. The Contractor shall follow all rules, regulations, and instructions stipulated by this specification, general provisions of the Contract, including General and Supplementary Conditions, Division 1 - General Requirements and all Specification Sections, if issued in conjunction with this Division 28 specification with regard to the following:

1. Delivery hours.

2. Delivery locations.

3. Storage.

4. Hazardous Material.

5. Security.

6. Hours of work.

7. Safety.

8. Logistics.

3.02 INTENT OF DRAWINGS AND SPECIFICATIONS

A. The Contractor shall keep on the Project site a copy of the Specifications and Drawings, and the same shall be available at all reasonable times for inspection and use by the ITPC or his/her designate and by any other person authorized by the ITPC. Any Drawings listed in the detail Specifications shall be regarded as a part thereof and of the Contract. Anything mentioned in these Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in these Specifications, shall be of like effect as though shown or mentioned in both.

B. It shall be the duty of the Contractor to see that the provisions of these Specifications are complied with in detail irrespective of the inspection given the work during its progress by the ITPC or his/her designate. Any failure on the part of the Contractor to observe the Specifications will be sufficient cause for the rejection of the work at any time before its acceptance.

C. The ITPC will furnish from time to time, such detail drawings, drawings, profiles, and information as the ITPC may consider necessary for Contractor's guidance to insure the proper and adequate execution of the Contract. Contractor shall comply with such detail drawings, drawings, profiles, and information.

D. Only favorably reviewed shop drawings and submittals shall be used in construction.

E. Comply with Division 01 - General Requirements.

F. DO NOT USE drawing scale to determine exact dimensions or exact location. Scaled drawings are still to be considered diagrammatic and scale should be used for estimates only. If exact lengths or location placement dimensions are required, the drawings will specifically show those dimensions or placement coordinates.

3.03 INSTALLATION

Furnish all required materials, equipment, and tools necessary to properly complete the work of these specifications including, but not limited to, tools for pulling and terminating the cables, mounting hardware, cable ties, bolts, anchors, clamps, hangers, kits of consumables, lubricants, technician communication devices, cable testing equipment, stands for cable reels, etc.

3.04 EXAMINATION

A. The Contractor is responsible for examining existing conditions and comparing them with drawings and specifications and notifying the ITPC or his/her designate of any discrepancies.

B. The Contractor is responsible for coordinating with the ITPC or his/her designate to address, adjust, and resolve any discrepancies found before commencing work.

C. If a discrepancy between existing conditions and these drawings and specifications is found after commencing work, stop any work that in the Contractor's opinion is affected by the found discrepancy. It shall then be the Contractor's responsibility to resolve all issues caused by the found discrepancy before commencing work in work areas affected by the discrepancy.

3.05 VERIFICATION

A. It is incumbent upon the Contractor to verify that the installation and materials used have been inspected before they are enclosed within building features, or otherwise hidden from view. The Contractor shall bear costs associated with uncovering or exposing installations or features that have not been inspected and approved.

B. After installation, test, certify, and provide required warranties for the Electronic Safety and Security System installed per the requirements of this specification.

3.06 ADJUSTMENTS

The Contractor is responsible for coordinating and documenting with the ITPC or his/her designate the change order process. Coordinate specific needed forms and procedures for change orders with the ITPC or his/her designate.

3.07 LABELING

The Contractor is responsible for labeling and documenting all aspects of the installed infrastructure. The Contractor will not receive acceptance or final payments until the ITPC agrees that labeling and documentation is completed for the project.

KCCD has multiple college campuses and many individual buildings throughout the District. A labeling standard is required to develop a consistent database of infrastructure and networking documents. Since there are “Administration Buildings”, “Agriculture”, and “Campus Center” buildings on multiple campuses, it is important to develop unique labeling scheme that identifies individual buildings, Telecommunication Rooms (TRs), and cable drops identified for each unique college and campus. Please refer to the ITPC to confirm codes and alphas for the particular

college, campus, and buildings that you are working with. The following labeling standard has been developed and the Contractor will follow the labeling standard in all aspects of the work.

A. Labeling elements:

Labeling Element	Digits	Symbol
College Designator	1	C
Site Name (Campus or standalone building site name)	1	X
Building (3 digit alpha code for the building)	3	BBB
Serving TR (1st digit = floor, 2nd digit = a,b,c,etc)	2	##
Patch panel (1st digit = P, 2nd digit = patch panel #)	2	P@
PP jack (the jack number 01-48 on the patch panel)	2	$$

B. Labeling examples:

Using two existing buildings on the Bakersfield College campus as an example, we will demonstrate how the labeling elements would be used to uniquely identify and label infrastructure. The Bakersfield College designator is “B”. Site name for the Bakersfield College main campus is “C”. The alpha designation for the Administration building is “ADN”. The alpha designation for the Campus Center is “CCR”.

C. The label affixed to both ends of an outside plant fiber optic cable that feeds from the Administration building (TR 1a) to the Campus Center (TR 1a) would look like the following: BC-ADN-1a-BC-CCR-1a. Then the contractor would affix details of the cable such as copper count, fiber count, cable type, etc.

D. The label affixed to both ends of a riser cable that feeds from the Campus Center (TR 1a) to the Campus Center (TR 2a) would look like the following: BC-CCR-1a-BC-CCR-2a. Then the contractor would affix details of the cable such as copper count, fiber count, cable type, etc.

E. The label affixed to both ends of an individual data cable on a KCCD campus would look like the following: CX-BBB-##-P@-$$. This would clearly identify this cable to a unique college, building, TR, patch panel, and jack. An example using the Campus Center building second floor TR might be: BC-CCR-2a-P2-10, so this would be a cable connected to patch panel #2, jack 10, in TR 2a of the Campus Center building on college B (Bakersfield College), site name C (Main campus).

F. Each patch panel in the TR would be labeled with a patch panel number only (P1, P2, P3, etc). The manufacture jack labeling, numbers 01-48, would be used to indicate the jack number of the cables connected to the patch panel.An as-built floor plan of the coverage area of the TR will be mounted inside each TR by the Contractor. The floor plan will show the rooms and drop locations fed by the TR. The physical drop faceplate and the drop location on the as-built floor plan will be labeled with the TR identification, patch panel, and jack number for each cable fed by the TR.

3.08 LIST OF REQUIRED AS-BUILT DRAWINGS

A. As stated under "Submittals" above, as-built drawing files shall be "AutoCAD" or "AutoCAD Lite" 2014 or later release.

B. Electronic Safety and Security drawings updated with final as-built information. This shall be in the form of a complete set of Electronic Safety and Security drawings with as-built information indicated in colored pen based upon actual field conditions.

C. System schematic and block diagrams for every system updated with final as-built information. These drawings shall define the exact arrangement of each system including wiring configuration, device locations, and cable types.

D After review of as-built drawings by the ITPC or his/her designate, be prepared to make any required corrections for final submittal.

3.09 ACCEPTANCE

The project specified by this specification shall be considered completed and signed off as completed by the ITPC or his/her designate contingent upon the following:

A. All punch lists have been completed and signed as complete by the ITPC or his/her designate.

B. Required cable plant testing has been executed and required test result documentation has been submitted and approved by the ITPC or his/her designate.

C. Any required adjustments to as-built drawings including floor plans, rack elevations, wall elevations, and completed system wiring diagrams have been completed, submitted, and approved as complete by the ITPC or his/her designate.

D. Owner's manuals have been provided for every item of equipment when available from the manufacturer. These shall be the technical manuals provided by the manufacturer and shall not consist of generic sales brochures. Technical manuals shall provide complete specifications for the equipment as well as complete operating, maintenance, troubleshooting, and product repair/replacement information. Where available only in electronic format, the Contractor may provide a CD with electronic versions of Owner's manuals. CDs containing electronic versions of Owner's manuals must contain the proper software viewers for each document type.

1. Security System Component Manuals.

    a. Keypads.
    b. Door contacts.

2. Access Control System Component Manuals.

    a. Card readers.

    b. System software.

    c. Door control panels.

    d. Badging station.

3 Video Surveillance.

a. Interior cameras.

b. Exterior cameras.

E. System Operating Instructions: Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

F Required warranty documentation has been submitted and approved as complete by the ITPC or his/her designate.

END OF SECTION

Important Notes

1. SUBMITTALS REQUIRED - See specifications, Section 28 00 00, PART 1 - GENERAL, SUBMITTALS.
2. Any submittal of an "or equal" product must contain the product manufacturer's performance specifications cut sheet for that product.
3. Items not showing manufacturer and part # shall be furnished by the Contractor with submittal approval by the KCCD Information Technology Team.
4. Not all items listed are necessarily required for this project
5. If Line #s appear not to be sequential, those items have been removed since they are not required for this project.

Line #	Division 28 Section Number	Division 28 Section Name	Approved Manufacturer	Part #	As Specified, Or Equal	Description
1	28 13 00	Access Control	AMAG Technology		Or Equal	Multi Technology Card Reader
2	28 13 00	Access Control	AMAG Technology		Or Equal	Controller
3	28 13 00	Access Control	AMAG Technology		Or Equal	Security + Event Management System
4	28 13 00	Access Control	AMAG Technology		Or Equal	SiteServer
5	28 13 00	Access Control	AMAG Technology		Or Equal	Reader Module
6	28 13 00	Access Control	AMAG Technology		Or Equal	Input/output Modules (I8, R8, and I8-CSI)
7	28 13 00	Access Control	AMAG Technology		Or Equal	Uninterrupted Power Supply for iStar Controllers
8	28 13 00	Access Control	AMAG Technology		Or Equal	Exit Control Device
9	28 13 00	Access Control	DSI Design Security Inc.	ES4200 K4-T1	Or Equal	Door Management Alarm K-4 Rim Cylinders
10	28 13 00	Access Control	Techsphere Corporation	VP-II X	Or Equal	Biometric Card Reader - Hand Vascular Pattern Recognition Technology
11	28 13 00	Access Control	VonDuprin	99 Series	Or Equal	Door Hardware
12	28 13 00	Access Control	Onity (formerly TESA Entry Systems	Integra 5 System	Or Equal	Stand Alone Battery Operated Lock - for Residential Hall Interior Doors
13	28 13 00	Access Control	?	?	Or Equal	Stand Alone Battery Operated Networked Lock System e.g. Stanley Omnilock
14	28 23 00	Security Cameras	Avigilon	Video Software	Or Equal	IP Camera Video Software
15	28 23 00	Security Cameras	Pivot 3	DataBank STAC	Or Equal	Stackable Network Video Appliance
16	28 23 00	Security Cameras	Sony	SNCDH140T	Or Equal	Technology (IP Camera)
17	28 23 00	Security Cameras	Sony	SNCDH180	Or Equal	Technology and IR Illuminator (IP Camera)
18	28 23 00				Or Equal	
19	28 23 00				Or Equal	
20	28 30 00	Intrusion Detection	DMP	XR150	Or Equal	Burglary Alarm Zone Panel
21	28 30 00	Intrusion Detection	DMP	714-16	Or Equal	Zone Expander
22	28 30 00	Intrusion Detection	DMP	7060	Or Equal	LCD Keypad
23	28 30 00	Intrusion Detection	Honeywell	FG-1625	Or Equal	Glassbreak Detector
24	28 30 00	Intrusion Detection	Optex	FX-360	Or Equal	360 Ceiling Mount Passive Infrared Detector
25	28 30 00	Intrusion Detection	Optex	CX-702	Or Equal	Wall Mount Passive Infrared Detector
26	28 30 00	Intrusion Detection	DMP	263LTE-V/381-2	Or Equal	LTE Communicator, Verizon
27	28 30 00				Or Equal	

Important Notes

1. SUBMITTALS REQUIRED - See specifications, Section 28 00 00, PART 1 - GENERAL, SUBMITTALS.
2. Any submittal of an "or equal" product must contain the product manufacturer's performance specifications cut sheet for that product.
3. Items not showing manufacturer and part # shall be furnished by the Contractor with submittal approval by the KCCD Information Technology Team.
4. Not all items listed are necessarily required for this project
5. If Line #s appear not to be sequential, those items have been removed since they are not required for this project.

Line #	Division 28 Section Number	Division 28 Section Name	Approved Manufacturer	Part #	As Specified, Or Equal	Description
28					Or Equal	
29					Or Equal	
30					Or Equal	
31					Or Equal	
32					Or Equal	
33					Or Equal	
34					Or Equal	
35					Or Equal	
36					Or Equal	
37					Or Equal	
38					Or Equal	
39					Or Equal	
40					Or Equal	
41					Or Equal	
42					Or Equal	
43					Or Equal	
44						
45					Or Equal	
46					Or Equal	
47					Or Equal	
48					Or Equal	
49					Or Equal	
50					Or Equal	
51					Or Equal	
52					Or Equal	
53					Or Equal	
54					Or Equal	

SECTION 281300
ACCESS CONTROL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all services, labor, materials, tools, and equipment required to furnish, label, test, document and warranty the Access Control System specified in this Section of the Division 28 specifications and accompanying construction drawings.

B. Those specification Sections of this Division that are particularly applicable to this Section include, but are not limited to, the following:

1. Section 28 06 00 - Schedules for Electronic Safety and Security

2. Section 28 23 00 - Video Surveillance Systems

3. Section 28 30 00 – Intrusion Detection

1.02 QUALITY CONTROL

Comply with Section 28 00 00 - Electronic Safety and Security.

1.03 WARRANTIES

Comply with Section 28 00 00 - Electronic Safety and Security.

1.04 MATERIAL SUBSTITUTIONS

Comply with Section 28 00 00 - Electronic Safety and Security.

1.05 SUBMITTALS

Comply with Section 28 00 00 - Electronic Safety and Security.

1.06 COORDINATION

Comply with Section 28 00 00 - Electronic Safety and Security.

PART 2 - PRODUCTS

2.01 QUANTITY DETERMINATION

Comply with Section 28 00 00 - Electronic Safety and Security.

2.02 ACCESS CONTROL SYSTEM COMPONENTS

A. System Components: Contractor to furnish all access control system electronics to include, but not necessarily limited to, any battery or UPS support requirements, hardware, software coordination, cable, and piece parts required by this project.

B. Cable and Cable Pathway: Contractor shall furnish all necessary wire, cable, connectors, and cable pathway required for the proper installation of a complete working system. Coordinate supply and installation of cable and cable pathway components with other trades.

1. Cable management devices must be sized to accommodate 100% spare capacity of the final installed cable base.

2. Bridle rings shall not be acceptable.

C. Reference Section 28 06 00 - Schedule for Electronic Security and Safety, KCCD Master Pre-Approved Product/Material/Manufacturer List Index, Product/Material Category, "Access Control."

PART 3 - EXECUTION

3.01 GENERAL

A. Install systems in accordance with UL, NEC, and all other applicable codes. Install system to comply with drawings and final shop drawings in compliance with manufacturer instructions. Provide all required hardware and labor for rack mounting of head-end system components.

B. Refer to plans for locations and quantities of equipment. Equipment locations shown on plans will be required to be field coordinated to ensure proper system operation.

C. No items of equipment shall be installed in such a manner as to void or reduce the proper operating characteristics of individual components or of the system. Devices such as motion detectors, audio detectors, glass break sensors, etc. shall be installed following the manufacturer's recommendations.

D. Perform all work under the onsite supervision of a factory authorized trained technician. It shall be the responsibility of the technician to check, inspect, and adjust this installation to the KCCD Information Technology Project Coordinator (ITPC) or his/her designates approval. If required, a Customer Service Representative of the installing contractor or manufacturer shall train the Owner's personnel on the proper operation and maintenance of the equipment. Perform all work in conjunction with this installation in accordance with good engineering practices.

3.02 CABLING

A. All wiring between devices shall be run open wired above accessible ceilings. Where existing cable management systems are in place and there is adequate capacity to install the system wiring, the contractor may utilize these pathways providing they have coordinated with all other wiring contractors on site.

B. Where pathways do not exist for access system wiring, the Contractor shall be responsible for providing all required cable management systems such as sleeves, conduits, J-hooks, etc. to support communications cabling to meet building codes and manufacturer's recommendations.

C. All cabling installed in ceiling spaces that are used for air distribution plenums shall be UL plenum rated.

D. The Contractor shall be responsible for furnishing and installing all required cabling between components to form a complete and operational system meeting all the requirements of this specifications and conjoined construction drawings.

E. The Contractor shall be responsible for interconnection and signaling including all wiring and terminations at both ends for the following auxiliary systems:

1. Fire Alarm – for control of doors during fire alarm and for release of door hold-opens connected directly to the fire alarm system;

2. Paging System – Connection to the building wide paging system for pre-alarm all-call

tone/announcement;

3. Building Automation System – Connection to the building automation system for signaling for morning entry (first valid swipe and alarm de-activation) and evening vacancy (alarm activation);

4. Elevator – Connection to the elevator controller for card reader access to the elevator;

5. Intercom – Connection to the intercom system panel for signaling of electronic door locks via pushbutton operation of intercom master stations;

6. IP CCTV – Connection to the IP CCTV system for video file links and live video icons on the graphical floor plans.

3.03 TELECOMMUNICATION ROOMS

A. Coordinate with Division 26 - Electrical, Division 27 – Communications, and the ITPC for control panel and electrical locations in each Telecommunication Room (TR).

B. Install the controller panels within the TRs that service the floor where the access control and card readers are located.

C. The access control and card reader controller panels will be wall mounted in the TR.

D. The access control and card reader control panels shall be mounted in a 4 feet wide by 4 feet tall wall area within the TR.

E. The lay-out of the TR as depicted on the drawings shall be utilized as a general guide for bidding purposes. The final room layout shall be carefully coordinated with input from the ITPC or his/her designate and from other trades with equipment and/or cabinets to be placed in the room. Prior to permanent mounting of equipment or termination of cabling, obtain approval of TR layout space assignments from the ITPC or his/her designate.

F. Grounding

1. The installing contractor shall be responsible for ensuring the grounding integrity of all installed equipment to eliminate the potential for equipment or personnel hazards due to improperly or inadequately grounded systems.

2. All grounding and bonding shall be in conformance with the National Electric Code, article 250 and as recommended by ANSI/EIA/TIA-607.

3.04 DELIVERY, STORAGE, AND HANDLING

Comply with Section 28 00 00 - Electronic Safety and Security.

3.05 EXAMINATION

Comply with 28 00 00 - Electronic Safety and Security.

3.06 LABELING

A. Reference construction drawings accompanying this Division 28 specification.

B. Comply with 28 00 00 - Electronic Safety and Security.

C. Contractor shall identify all major items of equipment and tag all cables with permanent type

markers to denote equipment served. Cables shall be tagged at both ends and at each point where the cable is administered.

D. All labeling and recording shall be approved by the ITPC or his/her designate prior to application.

3.07 TESTING

A. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The ITPC or his/her designate will witness all performance verification. Original copies of all data produced during performance verification shall be turned over to the ITPC or his/her designate at the conclusion of testing prior to final approval.

B. The field testing shall as a minimum include:

1. Verification that alarm points are received, annunciated properly, and transmitted through the central monitoring station.

2. Verification that all motion detectors have the proper coverage patterns and that false alarms are not being generated due to motion coverage patterns into adjacent areas.

3. Verification that all user input and control features are accessible at each keypad and at the control station.

4. Verification that the final system programming including schedules and sequence of operation are performing as expected.

5. Verification that access control features including door control and door position sensing are operating properly and as required by the ITPC or his/her designate and as established during the programming phase.

C. The Contractor shall deliver a report describing results of functional tests, diagnostics, and calibrations including written certification to the ITPC or his/her designate that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. The report shall also include a copy of the approved performance verification test procedure.

3.08 AS BUILT DRAWINGS

Comply with Section 28 00 00 - Electronic Safety and Security.

3.09 VERIFICATION

Comply with Section 28 00 00 - Electronic Safety and Security.

3.10 ADJUSTMENTS

Comply with Section 28 00 00 - Electronic Safety and Security.

END OF SECTION

SECTION 282300
VIDEO SURVEILLANCE SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all services, labor, materials, tools, and equipment required to furnish, label, test, document and warranty the Video Surveillance Systems specified by this Section of the Division 28 specifications and accompanying construction drawings.

B. Those specification Sections of this Division that are particularly applicable to this Section include, but are not limited to, the following:

1. Section 28 06 00 - Schedules for Electronic Safety and Security

2. Section 28 13 00 - Access Control Systems

3. Section 28 30 00 – Intrusion Detection

C. Video Surveillance System Description

1. The new system shall be an IP based, POE powered camera Video Surveillance Security system. The System shall include site preparation, running of system wires and cables, system component installation, component testing, and system acceptance. Each system shall be complete and ready for operation.

2. In-line powered (POE) data network connection capable of 1 Gigabit network speed will be provided by the KCCD IT Department for each IP camera.

1.02 QUALITY CONTROL

Comply with Section 28 00 00 - Electronic Safety and Security.

1.03 WARRANTIES

Comply with Section 28 00 00 - Electronic Safety and Security.

1.04 MATERIAL SUBSTITUTIONS

Comply with Section 28 00 00 - Electronic Safety and Security.

1.05 SUBMITTALS

Comply with Section 28 00 00 - Electronic Safety and Security.

1.06 COORDINATION

Comply with Section 28 00 00 - Electronic Safety and Security.

PART 2 - PRODUCTS

2.01 QUANTITY DETERMINATION

Comply with Section 28 00 00 - Electronic Safety and Security.

2.02 VIDEO SURVEILLANCE SYSTEM COMPONENTS

A. System Components: Contractor to furnish all video surveillance system cameras and electronics to include, but not necessarily limited to, any battery or UPS support

requirements, enclosures, software, cable, and piece parts required by this project.

B. Cable and Cable Pathway: Contractor shall furnish all necessary wire, cable, accessories, and cable pathway components required for the proper installation of a complete working system. Coordinate supply and installation of cable and cable pathway components with other trades.

1. Cable management devices must be sized to accommodate 100% spare capacity of the final installed cable base.

2. Bridle rings shall not be acceptable.

C. Reference Section 28 06 00 - Schedule for Electronic Security and Safety, KCCD Master Pre-Approved Product/Material/Manufacturer List Index, Product/Material Category, "Security Cameras."

PART 3 - EXECUTION

3.01 GENERAL

A. Install systems in accordance with Underwriter Laboratories (UL), National Electric Code (NEC), and all other applicable codes. Install system to comply with drawings and final shop drawings in compliance with manufacturer instructions. Provide all required hardware and labor for rack mounting of head-end system components.

B. Refer to plans for locations and quantities of equipment. Equipment locations shown on plans will be required to be field coordinated to ensure proper system operation.

C. No items of equipment shall be installed in such a manner as to void or reduce the proper operating characteristics of individual components or of the system. All devices shall be installed following the manufacturer’s recommendations.

D. Perform all work under the onsite supervision of a factory authorized, certified technician. It shall be the responsibility of the technician to check, inspect and adjust this installation to the KCCD Information Technology Project Coordinator (ITPC) or his/her designates approval. If required, a Customer Service Representative of the installing contractor or manufacturer shall train the Owner’s personnel on the proper operation and maintenance of the equipment. Perform all work in conjunction with this installation in accordance with good engineering practices.

3.02 CABLING

A. All wiring between devices shall be run open wired above accessible ceilings. Where existing cable management systems are in place and there is adequate capacity to install the video surveillance system wiring system wiring, the contractor may utilize these pathways providing they have coordinated with all other wiring contractor on site.

B. Where pathways do not exist for video surveillance system wiring, the Contractor shall be responsible for providing all required cable management systems such as sleeves, conduits, J-hooks, etc. to support communications cabling to meet building codes and manufacturer’s recommendations.

C. All cabling installed in ceiling spaces that are used for air distribution plenums shall be UL plenum rated.

D. Cables shall not be laid upon ceilings or supported in a manner that would violate any codes or standards.

E. All control and signal cable shall be installed continuous and without splices. Furnish appropriate connectors or pre-manufactured cables for each application.

F. The Contractor shall be responsible for furnishing and installing all required cabling between components to form a complete and operational system meeting all the requirements of this specifications and conjoined construction drawings.

3.03 TELECOMMUNICATION ROOMS

A. Digital Video Recorder (DVR), Network Video Recorder (NVR), or Server equipment must not be located in a Telecommunication Room (TR). DVR, NVR, or Server equipment must be located in an approved KCCD data center. Review the location and installation of this equipment with the ITPC.

B. The lay-out of the Telecommunications Rooms as depicted on the drawings shall be utilized as a general guide for bidding purposes. The final room layout shall be carefully coordinated with input from the ITPC or his/her designate and from other trades with equipment and/or cabinets to be placed in the room. Final configuration of Telecommunication Rooms shall be submitted to the ITPC as a coordination drawing with information from all other trades occupying the same room for review prior to permanent mounting of equipment or termination of cabling.

C. Coordinate surveillance system power requirements with electrical plans and locations of electrical outlets.

D. Grounding

1. The installing contractor shall be responsible for ensuring the grounding integrity of all installed equipment to eliminate the potential for equipment or personnel hazards due to improperly or inadequately grounded systems.

2. All grounding and bonding shall be in conformance with the National Electric Code, article 250 and as recommended by ANSI/EIA/TIA-607.

3.04 DELIVERY, STORAGE, AND HANDLING

Comply with Section 28 00 00 - Electronic Safety and Security.

3.05 EXAMINATION

Comply with 28 00 00 - Electronic Safety and Security.

3.06 LABELING

A. Reference construction drawings accompanying this Division 28 specification.

B. Comply with 28 00 00 - Electronic Safety and Security.

C. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served. Cables shall be tagged at both ends and at each point where the cable is administered.

D. The contractor shall be responsible for generating and programming the labeling for camera information within the recorder software.

E. All labeling and recording shall be approved by the ITPC or his/her designate prior to application.

3.07 TESTING

A. System Startup

1. The Contractor shall not apply power to the video surveillance system until the following items have been completed:

   a. Video Surveillance system equipment items and circuitry have been set up in accordance with manufacturer's instructions.

   b. A visual inspection of the video surveillance system has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.

   c. System wiring has been tested and verified as correctly connected as indicated.

   d. All system grounding and transient protection systems have been verified as properly installed and connected as indicated.

   e. Power supplies to be connected to the video surveillance system have been verified as the correct voltage, phasing, and frequency as indicated.

2. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installation, defective equipment items, or collateral damage as a result of Contractor work/equipment.

B. Site Testing

1. General: The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The ITPC or his/her designate will witness all performance verification. Original copies of all data produced during performance verification shall be turned over to the ITPC or his/her designate at the conclusion of testing prior to final approval.

2. Performance verification testing shall as a minimum include:
   a. Verification that the video transmission system and any signal or control cabling have been installed, tested, and approved.

   b. Verification that the Digital Video Recorder (DVR) is fully functional and that the DVR has been programmed as needed for the site configuration.

   c. Verify that each IP camera is network enabled, verify network settings (IP address, Compression, Video Streaming, etc.), confirm video stream is available at the DVR/NVR and at the remote network clients. Provide digital image from each camera documenting original field of view and lens setting.

3. The Contractor shall deliver a report describing results of functional tests, diagnostics, and network settings including written certification to the ITPC or his/her designate that the installed complete system has been tested and is ready to begin operation. The report shall also include the following:

   a. A copy of the performance verification test procedures.

   b. Note any objects in the field of view that might produce highlights that could cause camera blinding.

   c. Note any objects in the field of view or anomalies that may cause blind spots.

d. Note if a camera cannot be aimed to cover the zone.

e. Note night assessment capabilities and whether lights or vehicle headlights cause blooming or picture degradation.

f. Note camera locations where low light levels may require supplemental sight lighting or possibly IR Illuminators.

3.08 AS BUILT DRAWINGS

Comply with Section 28 00 00 - Electronic Safety and Security.

3.09 VERIFICATION

Comply with Section 28 00 00 - Electronic Safety and Security.

3.10 ADJUSTMENTS

Comply with Section 28 00 00 - Electronic Safety and Security.

END OF SECTION

SECTION 283000
INTRUSION DETECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all services, labor, materials, tools, and equipment required to furnish, label, test, document and warranty the Intrusion Detection System specified in this Section of the Division 28 specifications and accompanying construction drawings.

B. Those specification Sections of this Division that are particularly applicable to this Section include, but are not limited to, the following:

1. Section 28 06 00 - Schedules for Electronic Safety and Security

2. Section 28 13 00 – Access Control System

3. Section 28 23 00 - Video Surveillance Systems

1.02 QUALITY CONTROL

Comply with Section 28 00 00 - Electronic Safety and Security.

1.03 WARRANTIES

Comply with Section 28 00 00 - Electronic Safety and Security.

1.04 MATERIAL SUBSTITUTIONS

Comply with Section 28 00 00 - Electronic Safety and Security.

1.05 SUBMITTALS

Comply with Section 28 00 00 - Electronic Safety and Security.

1.06 COORDINATION

Comply with Section 28 00 00 - Electronic Safety and Security.

PART 2 - PRODUCTS

2.01 QUANTITY DETERMINATION

Comply with Section 28 00 00 - Electronic Safety and Security.

2.02 INTRUSION DETECTION COMPONENTS

A. System Components: Contractor to furnish all intrusion detection system electronics to include, but not necessarily limited to, any battery requirements, hardware, LTE communicator, software coordination, cable, and piece parts required by this project.

B. Cable and Cable Pathway: Contractor shall furnish all necessary wire, cable, connectors, and cable pathway required for the proper installation of a complete working system. Coordinate supply and installation of cable and cable pathway components with other trades.

1. Cable management devices must be sized to accommodate 100% spare capacity of the final installed cable base.

2. Bridle rings shall not be acceptable.

C. Reference Section 28 06 00 - Schedule for Electronic Security and Safety, KCCD Master Pre-Approved Product/Material/Manufacturer List Index, Product/Material Category, "Access Control."

PART 3 - EXECUTION

3.01 GENERAL

A. Install systems in accordance with UL, NEC, and all other applicable codes. Install system to comply with drawings and final shop drawings in compliance with manufacturer instructions. Provide all required hardware and labor for rack mounting of head-end system components.

B. Refer to plans for locations and quantities of equipment. Equipment locations shown on plans will be required to be field coordinated to ensure proper system operation.

C. No items of equipment shall be installed in such a manner as to void or reduce the proper operating characteristics of individual components or of the system. Devices such as motion detectors, audio detectors, glass break sensors, etc. shall be installed following the manufacturer’s recommendations.

D. Perform all work under the onsite supervision of a factory authorized trained technician. It shall be the responsibility of the technician to check, inspect, and adjust this installation to the KCCD Information Technology Project Coordinator (ITPC) or his/her designates approval. If required, a Customer Service Representative of the installing contractor or manufacturer shall train the Owner’s personnel on the proper operation and maintenance of the equipment. Perform all work in conjunction with this installation in accordance with good engineering practices.

3.02 CABLING

A. All wiring between devices shall be run within conduits and cable trays. Where existing cable management systems are in place and there is adequate capacity to install the system wiring, the contractor may utilize these pathways providing they have coordinated with all other wiring contractors on site.

B. Where pathways do not exist for access system wiring, the Contractor shall be responsible for providing all required cable management systems such as sleeves, conduits, J-hooks, etc. to support communications cabling to meet building codes and manufacturer’s recommendations.

C. All cabling installed in ceiling spaces that are used for air distribution plenums shall be UL plenum rated.

D. The Contractor shall be responsible for furnishing and installing all required cabling between components to form a complete and operational system meeting all the requirements of this specifications and conjoined construction drawings.

E. The Contractor shall be responsible for interconnection and signaling including all wiring and terminations at both ends to the Central Monitoring Station.

3.03 TELECOMMUNICATION ROOMS

A. Coordinate with Division 26 - Electrical, Division 27 – Communications, and the ITPC for control panel and electrical locations in each Telecommunication Room (TR).

B. Install the controller panels within the TRs that service the floor where the intrusion detection devices are located.

C. The intrusion detection panels will be wall mounted in the TR.

D. The intrusion detection shall be mounted in a 4 feet wide by 4 feet tall wall area within the TR.

E. The lay-out of the TR as depicted on the drawings shall be utilized as a general guide for bidding purposes. The final room layout shall be carefully coordinated with input from the ITPC or his/her designate and from other trades with equipment and/or cabinets to be placed in the room. Prior to permanent mounting of equipment or termination of cabling, obtain approval of TR layout space assignments from the ITPC or his/her designate.

F. Grounding

1. The installing contractor shall be responsible for ensuring the grounding integrity of all installed equipment to eliminate the potential for equipment or personnel hazards due to improperly or inadequately grounded systems.

2. All grounding and bonding shall be in conformance with the National Electric Code, article 250 and as recommended by ANSI/EIA/TIA-607.

3.04 DELIVERY, STORAGE, AND HANDLING

Comply with Section 28 00 00 - Electronic Safety and Security.

3.05 EXAMINATION

Comply with 28 00 00 - Electronic Safety and Security.

3.06 LABELING

A. Reference construction drawings accompanying this Division 28 specification.

B. Comply with 28 00 00 - Electronic Safety and Security.

C. Contractor shall identify all major items of equipment and tag all cables with permanent type markers to denote equipment served. Cables shall be tagged at both ends and at each point where the cable is administered.

D. All labeling and recording shall be approved by the ITPC or his/her designate prior to application.

3.07 TESTING

A. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The ITPC or his/her designate will witness all performance verification. Original copies of all data produced during performance verification shall be turned over to the ITPC or his/her designate at the conclusion of testing prior to final approval.

B. The field testing shall as a minimum include:

1. Verification that alarm points are received, annunciated properly, and transmitted through the central monitoring station.
2.

3. Verification that all motion detectors have the proper coverage patterns and that false alarms are not being generated due to motion coverage patterns into adjacent areas.

4. Verification that all user input and control features are accessible at each keypad and at the control station.

5. Verification that the final system programming including schedules and sequence of operation are performing as expected.

6. Verification of LTE connection to central monitoring station.

C. The Contractor shall deliver a report describing results of functional tests, diagnostics, and calibrations including written certification to the ITPC or his/her designate that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. The report shall also include a copy of the approved performance verification test procedure.

3.08 AS BUILT DRAWINGS

Comply with Section 28 00 00 - Electronic Safety and Security.

3.09 VERIFICATION

Comply with Section 28 00 00 - Electronic Safety and Security.

3.10 ADJUSTMENTS

Comply with Section 28 00 00 - Electronic Safety and Security.

END OF SECTION

SECTION 283100
FIRE ALARM / EMERGENCY VOICE ALARM COMMUNICATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections shall form a part of this Section, with the same force and effect as though repeated here.

1.2 DESCRIPTION:

A. This section of the specifications includes the furnishing, installation, connection and programming of new microprocessor controlled, networked addressable reporting emergency voice alarm communication system fire alarm equipment to form a complete coordinated system ready for operation. It shall include, but not be limited to an emergency voice alarm communication system fire alarm panel, voice amplification power supplies, a voice alarm microphone, alarm initiating devices, alarm notification appliances, auxiliary monitoring and control devices.

B. This Section includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the Fire Alarm / Emergency Voice Alarm Communication System as required by the drawings and specified herein.

1.3 SCOPE:

A. The Contractor shall furnish and install booster power panels, initiation devices and circuits, notification appliances and circuits, control relays, monitor modules and supervisory devices, as required to accomplish this intent whether or not specifically shown or specified.

B. The complete installation shall conform to the applicable sections of NFPA 72, state code requirements and the 2022 California Electrical Code with particular attention to Article 760.

C. The work specified herein shall be coordinated with the related work as specified elsewhere under the project specifications.

1.4 SUBMITTALS

A. Submittals for this Section shall be made according to the Conditions of the Contract, Division 01 Specification Sections and Specification Section 260100.

B. General:

1. Five copies of all submittals shall be submitted to the Architect/Engineer for review.

2. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

C. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

3. Show remote annunciator(s) layout, configurations, and terminations.

4. Shop drawings shall show valid Contractor’s C-10 license, wet-signed by C-10 license holder.

D. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manual listing the manufacturer's name(s) including technical data sheets.

2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.

3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

E. Certifications:

1. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.5 WARRANTY

A. All work performed and all material and equipment furnished under this Contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid and is part of this Contract.

1.6 APPLICABLE STANDARDS:

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with these standards.

1. 2019 NFPA 72 National Fire Alarm Code
2. 2022 California Electrical Code (CEC)
3. 2022 California Fire Code (CFC)
4. 2022 California Mechanical Code (CMC)
5. 2022 California Building Code (CBC)
6. Underwriters Laboratories Inc. (UL) - USA:
7. California State Fire Marshal
8. All requirements of the Authority Having Jurisdiction (AHJ).

1.7 APPROVALS:

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

1. UL Underwriters Laboratories Inc.
2. CSFM California State Fire Marshal

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. This emergency voice alarm communication and fire alarm system design is based on the use of microprocessor-based addressable emergency voice alarm communication and fire alarm control equipment, initiation devices and notification appliances equipment manufactured by Simplex. New emergency voice alarm communication and fire alarm system equipment shall be compatible with the existing campus Simplex fire alarm system.

2.2 EMERGENCY VOICE ALARM COMMUNICATION AND FIRE ALARM EXTENDER PANEL (FAXP):

A. The Fire Alarm Extender Panel shall be the Simplex 4009-9201 panel. The fire alarm extender panel shall be complete with cabinets, batteries, battery charger and all miscellaneous components required for a complete and fully functional networked fire alarm system when connected to an existing FACP.

B. The Fire Alarm Extender Panel shall be provided with a Simplex 4100-0625 Local Mode Controller Card.

C. Digital Alarm Communicator Transmitter (DACT)

1. Listed and labeled under UL 864 and NFPA 72.

2. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP panel, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising two lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

3. The DACT shall be Carrier Information Code (CIC) compliant and shall transmit all popular transmission formats and shall have a sixteen digit telephone number field. The Contractor shall coordinate with the District's UL Listed central monitoring station and ensure compatible transmission format.

4. Self Test: Conducted automatically every 24 hours with report transmitted to central station.

D. Batteries:

1. Shall be maintenance free, VRLA AGM lead-acid type.

2. Batteries shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 15 minutes of alarm upon a normal AC power failure.

3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

2.3 INITIATION DEVICES

A. Manual Pull Stations

1. Manual Pull Station

a. Manual Pull Stations shall be the type that are acceptable to the DSA and that meet the DSA interpretation of ADA requirements for manual pull stations.

1) Manual Pull Stations shall not require tight grasping, pinching or twisting of the wrist, per CBC 11B-309.4.

2) Manual Pull Stations shall have Braille text operating instructions molded into the case.

b. Manual Pull Stations may be addressable devices or conventional non-addressable devices that are individually monitored through an addressable monitor module.

c. Manual Pull Stations shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

d. All operated stations shall have a positive, visual indication of operation that cannot be reset without the use of a key.

e. Manual Stations shall be constructed of LEXAN (or polycarbonate equivalent) with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.

f. Stations shall be suitable for surface mounting or semi-flush mounting.

B. Duct Smoke Detectors

1. Duct smoke detectors shall be the 120VAC type. Provide one addressable monitor module at each duct smoke detector. Each duct smoke detector shall be individually monitored by the fire alarm system though the addressable monitor module and shall report only as a supervisory signal to the supervising station per California Fire Code, Article 907.3.1.

2. A listed remote test and reset switch shall be furnished and installed for each duct smoke detector.

2.4 ADDRESSABLE MODULES, CONTROL RELAYS, AND AUXILIARY DEVICES

A. Addressable Monitor Module

1. Addressable Monitor modules shall be provided to connect one supervised IDC (zone) of conventional Alarm Initiating Devices (any N.O. dry contact device) to the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loop.

2. The monitor module shall be mounted in a 4-inch square, 2-1/8" deep electrical box.

3. The IDC (zone) may be wired for Style D (Class A) or Style B (Class B) operation. The Monitor module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Fire Alarm Control Panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

B. Addressable Control Module

1. Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual appliances or audio speakers.

2. The Control Module shall be mounted in a standard 4-inch square, 2-1/8" deep electrical box.

3. The NAC shall wire in a Class B (Style Y) or Class A (Style Z) fashion. Each control module shall support up to 1 Amp of Inductive or 2 Amps of Resistive Audible/Visual signals.

4. Audible/Visual power shall be provided by a separate notification appliance circuit from the main Fire Alarm Control Panel or from a fire alarm expander panel.

5. The Control Module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Control Panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the Control Module is operational and is in regular communication with the control panel.

6. A magnetic test switch shall be provided to test the module without opening or shorting its NAC circuit wiring.

C. Auxiliary Relays

1. Auxiliary relay coils shall be rated at 120V and contacts shall be rated for 120V, 20A, and shall conform to UL 864.

2. Auxiliary relays shall be listed with the California State Fire Marshal (CSFM).

2.5 NOTIFICATION APPLIANCES

A. Speakers

1. ADA/NFPA/ANSI compliant

2. Complies with OSHA 29 Part 1910.165

3. 24 VDC with wide UL “Regulated Voltage” using filtered DC or unfiltered VRMS input voltage

4. Field selectable taps for 25 or 70 VRMS operation from 1/8 watt up to 2 watts (indoor), 1/8 watt up to 8 watt (outdoor)

5. High efficiency design for maximum output at minimum wattage across a frequency range of 400 to 4000 HZ

6. Fast installation with IN/OUT screw terminals using #12 to #18 AWG wires

7. Optional Extender (E60 Ext) is for mounting to 4” backboxes with no extension ring.

8. Weatherproof with extended temperature range of –40°F to 150°F (-40°C to 66°C)

B. Combination Speaker/Strobes

1. ADA/NFPA/ANSI compliant
2. Complies with OSHA 29 Part 1910.165
3. Ceiling mount strobe models are available with field selectable candela settings of 15/30/75/95cd or 115/177cd (multi-candela models)
4. Strobes produce 1 flash per second over the regulated voltage range
5. 24 VDC with wide UL “Regulated Voltage” using filtered DC or unfiltered VRMS input voltage
6. Field selectable taps for 25 or 70 VRMS operation from 1/8 watt up to 2 watts
7. High efficiency design for maximum output at minimum wattage across a frequency range of 400 to 4000 HZ
8. Fast installation with IN/OUT screw terminals using #12 to #18 AWG wires
9. Optional Extender (E60 Ext) is for mounting to 4” backboxes with no extension ring.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the equipment manufacturer.

B. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

3.2 WIRING INSTALLATION

A. Fire Alarm System initiation device circuits and notification appliance circuits shall be installed in conduit. The minimum conduit size shall be ¾”.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

D. Each Fire Alarm Control Panel and Fire Alarm Booster Power Panel shall be connected to a separate dedicated 120V, 20A branch circuit with a dedicated neutral

conductor and an equipment grounding conductor. Provide a circuit breaker lock-on devices on each circuit breaker supplying fire alarm system equipment and provide a red label that reads: "FIRE ALARM / ECS" adjacent to the circuit breaker.

E. Fire Alarm Booster Power Panel Primary Power wiring shall be 12 AWG copper.

F. Where the new fire alarm control panel is tied to an existing fire alarm control panel, the Contractor shall provide, install and connect all wiring, addressable control relays and addressable monitor modules at both the new and existing control panels and program to allow each fire alarm panel to accept and respond to alarm, trouble and supervisory initiation signals from the other fire alarm control panel.

3.3 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. The Fire Alarm Panel cabinet shall be grounded with an equipment grounding conductor that is run with the primary power wiring. Cabinet doors shall be bonded to cabinets with braided grounding straps of sufficient length to allow the cabinet door to fully open.

3.4 PROGRAMMING

A. The Contractor shall provide all programming of the Fire Alarm System to result in a complete and functional Fire Alarm System in accordance with all applicable codes and standards, and as specified herein.

B. Zone Programming:

1. The Contractor shall provide zone programming for the Fire Alarm System as follows:
    a. Each building shall be programmed as a separate zone.
    b. Each floor of a multi-story building shall be programmed as a separate zone.
    c. Each section of a floor in a building that is separated by area separation walls or by horizontal exits shall be programmed as a separate zone.
    d. Additional zones shall be programmed where deemed necessary by the authority having jurisdiction.
2. Zone programming for the Fire Alarm System shall match the zone map (refer to Article titled, IDENTIFICATION AND DOCUMENTATION, for zone map requirements.)

C. LCD Annunciation

1. The Contractor shall program the LCD annunciator at the Fire Alarm Control Panel and remote LCD annunciators to annunciate the following information:

   a. The zone that is in alarm.

   b. The type of alarm initiating device:

      1) Smoke Detector.

      2) Other.

   c. The location of the device that is in alarm (refer to Article titled, IDENTIFICATION AND DOCUMENTATION, for device map location requirements.)

D. Controls

1. The Contractor shall utilize addressable control relays and auxiliary relays and shall program the fire alarm system control panel to cause the closure of fire/smoke dampers and provide a signal for HVAC units to shut down.

E. Remote Monitoring Station

1. The contractor shall coordinate with the Remote Monitoring Station and program the system to report the number of points purchased by the Owner. Prior to the start of programming, Contractor shall verify how many point signals, above and beyond minimum code requirements, shall be transmitted to the monitoring station with Owner.

2. Where the new fire alarm control panel is tied to an existing fire alarm control panel, the Contractor shall program the existing fire alarm panel to accept and respond to alarm and trouble initiation signals from the new fire alarm control panel.

3.5 IDENTIFICATION AND DOCUMENTATION

A. Zone Map – The Contractor shall create an 11”x17” site plan identifying each building and identifying the zones. The zone map shall be created by a CAD program and shall be posted under plastic cover at the location of the fire alarm control panel.

B. Device Location Map – For each building the Contractor shall create an 11”x17” floor plan of the building showing the location of each device and the device address as it is annunciated at the control panel and remote annunciator. The device location map shall be created by a CAD program and shall be posted under plastic cover at the location of the fire alarm control panel or fire alarm booster power supply within each building.

C. Documentation Cabinet – Provide and install a documentation cabinet marked “FIRE ALARM SYSTEM RECORD DOCUMENTS” located adjacent to each fire alarm control unit.

D. Provide a red label at each branch circuit breaker that supplies power to the Fire Alarm Control Panel and Fire Alarm Booster Power Panels that reads: "FIRE ALARM / ECS”.

E. Provide a label on the inside of the cabinet door of each fire alarm cabinet that is supplied by a branch circuit that identifies the panel, circuit number and location of the power panel that is supplying that fire alarm cabinet.

3.6 FIRE WATCH

A. The Contractor shall provide a fire watch during the course of construction where any portion of the campus is rendered unprotected by the fire alarm system. The Contractor shall provide a 24-hour fire watch each day until the fire alarm system is fully operational. All costs of the fire watch shall be borne by the Contractor.

3.7 ACCEPTANCE TESTING AND CERTIFICATION

A. Prior to the final acceptance test provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system:

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

2. Open initiating device circuits and verify that the trouble signal actuates.

3. Open and short signaling line circuits and verify that the trouble signal actuates.

4. Open and short Notification Appliance Circuits and verify that trouble signal actuates.

5. Ground all circuits and verify response of trouble signals.

6. Check presence and audibility of tone at all alarm notification devices.

7. Check installation, supervision, and operation of all addressable smoke detectors using the Walk Test.

8. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

9. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying the controls performance by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.8

A. At the final inspection a manufacturer-trained representative shall demonstrate that the system functions properly in every respect.

B. Upon completion of the installation, a test of the entire system shall be performed in the presence of the Inspector of Record and the local authority having jurisdiction. The local Fire Marshal shall be notified and invited to witness the test a minimum of 72 hours prior to the test. Components and functions of the system shall be tested and an Inspection and Testing Record Form shall be generated in accordance with NFPA 72 indicating the proper functioning of each component of the system.

C. If devices or other components of the system fail during testing the defective devices or components shall be removed and immediately replaced with functional units and the test shall be repeated.

D. Complete the NFPA 72 Record of Completion, testing all devices and appliances. Provide a copy of the completed Record of Completion to the Owner (KCCD), Architect, Local Fire Authority and DSA via the Project Inspector.

3.9 INSTRUCTION

A. Provide instruction as required for operating the system. "Hands-on" demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided. The Contractor and/or the Systems Manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the Owner.

B. The Contractor shall furnish a full size complete set of fire alarm “as-built” record drawings on bond paper showing locations of all devices and the proper address of the device as it is displayed on the LCD annunciator at the fire alarm control panels and/or remote annunciators. This “as-built” set shall be located adjacent to the fire alarm control panel in the document cabinet for the reference of the Authority Having Jurisdiction.

3.10 CLOSEOUT SUBMITTAL

A. The Contractor shall submit closeout submittal documentation consisting of the following items:

1. Full size fire alarm “as-built” record drawings; drawings shall show valid Contractor’s C-10 license, wet-signed by C-10 license holder.

2. Device cut sheets and CSFM listing services;

3. A copy of the Fire Alarm System Record of Completion signed by the Installer and the Inspector of Record;

4. Owner’s Manuals and Operating Instructions.

END OF SECTION 283100

SECTION 311000
SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections:

1. Division 01 Section “Construction Waste Management” for management of waste materials.
2. Division 02 Section “Selective Demolition” for removal partial removal of buildings or structures.
3. Division 31 Section “Earthwork.”
4. Appendix; Geotechnical Report.

1.3 REFERENCES

A. Geotechnical Report by Krazan & Associates, Inc., report dated February 3, 2020**,** project number 012-19207 for earthwork requirements and recommendations.

1.4 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

1. Tree protection shall be defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.5 MATERIALS OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 SUBMITTALS

A. Existing Conditions: Digital photographic documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises at location directed by Architect.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion and sedimentation control and plant-protection measures are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Comply with requirements of referenced Geotechnical Report for site clearing operations.

B. Protect and maintain benchmarks and survey control points from disturbance during construction.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

D. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Identify trees to remain by wrapping a 1-inch blue vinyl tie tape flag around each tree trunk at 54 inches above the ground.

E. Protect trees, plant growth, and vegetation not specifically designated for removal.

F. Verify that existing plant life to be removed has been authorized for removal.

G. Examine site and compare individual work areas with the Drawings and Specifications.

H. Thoroughly investigate and verify conditions under which the work is to be performed.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Comply with Storm Water Pollution Prevention Plan (SWPPP) and requirements of authorities having jurisdiction.

B. Provide temporary erosion and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

C. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

D. Inspect, maintain, and repair erosion and sedimentation-control measures during construction until permanent vegetation has been established.

E. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Utilities to Remain: Locate, identify, and protect utilities that are to remain from damage.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

C. Utility Termination: Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place. Arrange with utility companies to shut off affected utilities and notify Owner not less than 48 hours in advance of utility termination.

1. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Clear only limited areas required for execution of work at proposed improvement location.

B. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of not less than 24 inches below the bottom of the lowest structure footing or 2 feet below finished subgrade whichever depth is lower. Root systems deeper than indicated above shall be excavated to allow no roots larger than 2 inches in diameter.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

C. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL EXCAVATION

A. Remove sod, grass, and similar vegetation before stripping topsoil.

B. Strip topsoil to depth of 6 inches or as indicated in the geotechnical report in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

3.6 SITE IMPROVEMENTS

A. Remove existing above and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated. Remove paving only where authorized and necessary to execute the Work.

1. Neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Remove concrete slabs, paving, walks, gutters, and curbs to nearest joint locations.

3. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 312300

EARTHWORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Materials, testing, and installation for excavations, fills, and backfills.

B. Related Sections include but are not necessarily limited to:

1. Section 31 11 00 – Site Clearing, Stripping and Grubbing.
2. Section 31 23 00 - SWPPP
3. Section 31 23 16 – Trenching, Backfilling and Compacting.

C. For additional information, refer to the Geotechnical Investigation Report (GIR) by Krazan and Associates dated February 3, 2020.

D. Measurement and Payment:

1. The contract lump sum price shall include full compensation for all costs and work involved with earthwork.

1.02 REFERENCES

A. ASTM International (ASTM):

1. D1556 – Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
2. D1557 – Standard Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18-Inch Drop.
3. D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
4. D2487 – Standard Test Method for Classification of Soils for Engineering Purposes.
5. D2488 – Practice for Description and Identification of Soils (Visual-Manual Procedure).
6. D2937 – Test Method for Density of Soil in Place by the Drive-Cylinder Method.
7. D2974 – Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
8. D6938 – Standard Test Methods for Density and Moisture Content of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).
9. E699 – Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM.

B. California Department of Transportation Standard Specifications, current edition (current edition):

1. CTM 216 Dry – California Test Method for Relative Compaction of Treated and Untreated Soils.
2. CTM 301 – California Test Method for the Determination of the Resistance “R” Value of Treated and Untreated Bases, Sub-bases, and Basement soils by the Stabilometer.

1.03 DEFINITIONS

A. Excavation consists of removal of material encountered during stripping and as required for removal of existing underground facilities indicated. It also includes disposal or temporary stockpile of material removed.

B. Unauthorized excavation consists of removal of materials beyond indicated elevations or dimensions without specific direction of the Contract Administrator. Unauthorized excavation, as well as remedial work directed by the Contract Administrator, shall be at Contractor's expense.

1. Under footings, foundation bases, fill-authorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to the ENGINEER.
2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of the same classification, unless otherwise directed by the ENGINEER.

C. Additional Excavation:

1. When excavation has reached required subgrade elevations; notify the ENGINEER who will make an inspection of conditions. If the ENGINEER determines bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by the ENGINEER.
2. Removal of unsuitable material that is unknown and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, drainage fill, or topsoil materials.

E. Structure: Foundations, slabs, tanks, vaults, or other man-made stationary features occurring above or below ground surface.

F. Stripping: Removal of the topsoil, surface vegetation and any miscellaneous obstructions prior to site grading.

G. Over-excavation: Over-excavation is generally reserved for soils that in their natural state will not provide adequate bearing capacity for structures.

H. Engineered Fill: Fill Material upon which the geotechnical engineer have made sufficient tests and observations to enable them to issue a statement that, in their opinion, the fill has been placed and compacted in accordance with the specification requirements and to the satisfaction of the Engineer.

I. Trench Backfill: Trench backfill shall consist of material placed between the pipe zone backfill/bedding and subgrade in paved areas or to the top of the trench in unpaved areas, unless otherwise shown or specified in the Contract.

1.04 SUBMITTALS

A. See Section 01 33 00 – Submittal Procedures for general submittal requirements and content.

B. Submit excavation and shoring drawings for worker protection in accordance with the General Provisions.

C. Submit six copies for materials acceptance reports from an approved testing laboratory verifying that the material meets the project requirements at least two weeks prior to use.

D. Furnish copy of dust control permit to Construction Manager prior to earthwork.

1.05 QUALITY ASSURANCE

A. Testing and Inspection Services: School District will employ and pay for a qualified independent geotechnical testing and inspection laboratory to perform soils testing and inspection services during earthwork operations.

B. Determine the density of soil in place by the sand cone method, ASTM D1556 or by nuclear method, ASTM D6938. Additional sand cones and densities will be required if the backfill material is visually variable. The minimum depth for the sand cone test hole shall be 12-inches. The minimum size shall be 8 inches, and size 16/30 or 10/20 silica sand shall be used. Compaction tests will be performed for each lift or layer.

C. Determine laboratory moisture-density relationship of soils per ASTM D1557 or Cal 216 Dry test methods. If nuclear methods are used for in-place density determination, the compaction test results for maximum dry density and optimum water content shall be adjusted in accordance with ASTM D4718. This will be required for determination of percent relative compaction and moisture variation from optimum.

D. Determine the relative density of cohesion-less soils per ASTM D4253 and D4254.

E. Sample materials per ASTM D75.

F. "Relative compaction" is the ratio, expressed as a percentage, of the in-place dry density to the laboratory maximum dry density.

G. Compaction shall be deemed to comply with the specifications when no more than one test of any three consecutive tests falls below the specified relative compaction. The one test shall be no more than three percentage points below the specified compaction percentage and shall be within two percentage points of the optimum moisture as determined by the optimum moisture-density relationship of soils test method. The Contractor shall pay the costs of any retesting of work not conforming to the specifications.

1.06 DISPOSAL OF EXCESS MATERIALS

A. Excess materials and waste from earthwork operations shall be disposed of off-site by the Contractor at his expense. The District has not determined or secured any sites or permits for disposal of excess material or waste.

1.07 MATERIAL AVAILABILITY

A. Sufficient earthwork material to complete the work is available at the site. Excess material haul-off is required.

PART 2 – PRODUCTS

2.01 ENGINEERED FILL

A. Engineered Fill is material to be placed beneath structures or pavements to the limits indicated on the drawings.

B. Engineered Fill material shall be free of organics and other debris and less than 3-inches in maximum dimension. Native soils may be used if they contain objects less than 3-inch in maximum dimension and contain less than 3 percent organic materials by weight (ASTM D2974).

C. Import Fill to be used as Engineered Fill shall be non-hazardous, non-corrosive, be derived from a single, consistent source and meet the following criteria in geotechnical report.

1. Gradation (ASTM C136)
2. Expansion index (ASTM D4829)
3. Plasticity (ASTM D4318)
4. Organic Content (ASTM D2974)
5. Corrosivity Potential (pH, Minimum resistivity (ohm-cm), Soluble Sulfate (ppm), Soluble Chloride (ppm))
6. Resistance Value (CTM 301)

2.02 ENGINEERED BACKFILL

A. Engineered Backfill is material to be placed adjacent to and around piping, structures, and areas not subject to adjacent structure foundation loading (areas not subject to adjacent structure foundation loading are areas from a distance 5-feet beyond the edge of structural slab or footing).

B. Engineered Backfill and Imported Fill to be used as Engineered Backfill shall comply with the requirements of Engineered Fill.

2.03 FILL

A. Fill material is material that is to be placed in locations that are not to be constructed as engineered fill or backfill.

B. Approximately 1-1/2 to 3 feet of non-native fill material was encountered within the site. The fill material that that have not been properly compacted per this specification shall be excavated and stockpiled. The fill material may be reused on-site provided is moisture-conditioned and compacted per the specifications.

2.04 SAND

A. Sand is granular material free from clay balls, organic matter, and other deleterious substances.

B. Sand shall be of such size that 90 percent to 100 percent will pass the number 4 sieve and not more than 5 percent will pass the number 200 sieve per Caltrans Sand bedding specification.

C. Sand shall have a minimum sand equivalent of 30 per ASTM D2419.

2.05 SAND-CEMENT SLURRY BACKFILL

A. Sand-cement slurry backfill shall consist of two sacks (188 pounds) of Type I or II Portland cement added per cubic yard of imported sand and sufficient water for workability.

2.06 WATER FOR COMPACTION

A. Water shall be free of organic materials and shall have a pH of 7.0 to 9.0, a maximum chloride concentration of 500-mg/L, and a maximum sulfate concentration of 500-mg/L. Provide all water needed for earthwork. Provide temporary piping and valves to convey water from the source to the point of use. Provide any meters if the water is taken from a city, water district, or agency pipeline.

2.07 AGGREGATE BASE

A. Use ¾-inch maximum, Class 2 Aggregate base material per Caltrans' Standard Specifications, Section 26 and Section 32 11 23 – Aggregate Base Courses.

2.08 GEOGRID

Geogrid shall be Tensar TriAx TX5 or equivalent approved by engineer.

PART 3 – EXECUTION

3.01 DEWATERING

A. Provide and operate equipment adequate to keep excavations and trenches free of water. Dewater subgrade to a minimum of 3-feet below bottom of excavation. Remove water during period when concrete is being deposited, when pipe is being laid, and during the placing of backfill. Avoid settlement or damage to adjacent property. Dispose of water in a manner that will not damage adjacent property. When dewatering open excavations, dewater from outside the structural limits and from a point below the bottom of the excavation. Obtain and comply with discharge permit from the City of Porterville.

3.02 EXCAVATION

A. General over-excavation below the footprint of the Buildings required to a minimum depth of 5-feet below the bottom of the deepest foundation. The over-excavation shall extend laterally 5-feet beyond the edge of building footings. The resulting excavation shall be observed and approved by a representative of the Geotechnical Engineer prior to proof rolling, scarification, placing of fill, and compaction.

B. Excavation is unclassified. Perform excavation regardless of the type, nature, or condition of the material encountered to accomplish the construction. Do not operate excavation equipment within 5-feet of existing structures or newly completed construction. Excavate with hand tools in these areas.

C. After the required excavation has been completed, the ENGINEER will observe the exposed subgrade to determine the need for any additional excavation. It is the intent that additional excavation is to be conducted in all areas within the influence of the structure where unacceptable subgrade materials exist at the exposed subgrade. Over-excavation shall include the removal of all such unacceptable material that exists directly beneath the structure or within a zone outside and below the structure from 5-feet outside the bottom edge of the footing. Refill the over-excavated areas with Engineered Backfill Material.

D. The Contractor will not receive any additional payment for refill material used for his convenience.

E. Excavations shall have sloping, sheeting, shoring, and bracing conforming with 29CFR1926 Subpart P-Excavations, CAL/OSHA requirements, and the General Provisions.

3.03 LIMITS OF FOUNDATION EXCAVATION

A. Excavate to the depths and widths needed to accomplish the construction. Allow for forms, working space, engineered backfill, and site grading. Do not excavate for footings, slabs, or conduits below elevations indicated. Unless unacceptable material is encountered and over-excavation is authorized by the Owner, backfill over-excavations with compacted Engineered Backfill material. Correct cuts below grade by benching adjoining areas and creating a smooth transition. The Contractor shall bear all costs for correcting unauthorized over-excavated areas.

3.04 PREPARATION FOR PLACING FILL OR BACKFILL

A. Remove foreign materials and trash from the excavation before backfilling.

B. Scarify the final subgrade surface to a depth of 12-inches, uniformly moisture condition to or above optimum moisture content, proof-roll to detect soft areas, and compact to 95% relative compaction beneath structures, vaults, and equipment pads.

3.05 PLACING AND COMPACTION FILL AND ENGINEERED FILL

A. Excavated material may be used for fill and engineered fill providing materials meet the specified requirements for structure fill, backfill, and fill material.

B. Place in maximum 6-inch lifts, moisture condition to 2% of optimum, and compact each lift to a minimum 90% relative compaction.

C. Where fill is to be constructed on slopes steeper than 5:1, bench the fill into competent undisturbed materials as the fill progresses up the slope. Benches shall be sloped at least 2% into the slope and shall be of a width at least equal to the height of fill lift.

3.06 GEOGRID INSTALLATION

A. Over-excavation for geogrid shall extend a minimum of 5 feet below the bottom of the deepest foundation and the resulting excavation should be backfilled with a layered system of Engineered Fill and geogrid reinforcement. The depth of over-excavation shall be measured from the rough pad grades depicted on the civil plans.

B. The first layer of geogrid reinforcement will be placed directly at the bottom of the excavation. The geogrid material should be overlapped a minimum of 3 feet in all directions. The geogrid strips should be “shingled” such that the exposed geogrid edge is opposite the direction of fill placement (as roof shingles to rain runoff). No vehicles may traverse the geogrid prior to placement of the Engineered Fill cover. The next layer of geogrid should be placed on top of the compacted Engineered Fill. This and subsequent layers need only be overlapped a minimum of 1 foot on all sides. The geogrid strips of this layer, and all subsequent layers within the footprint, should be placed with lengths perpendicular to those in the layer immediately below. The fill soils excavated from the area beneath the structure

may be moisture-conditioned and recompacted between geogrid layers as reinforced fill.

C. A total of 5 geogrid layers, including the later at the base of the excavation should be installed at vertical increment of 1 foot. The geogrid should extend to a minimum of 5 feet beyond the exterior edge footing perimeter of the structure. Where structures are abutting each other with variable footing depths the geogrid reinforcement shall overlap a minimum of 5 feet.

3.07 PREPARATION OF FOUNDATION SUBGRADE

A. The finished subgrade for foundations and equipment slabs shall be within a tolerance of ±0.08 of a foot of the grade and cross section indicated, shall be smooth and free from irregularities, and shall be at the specified relative compaction.

B. Compact the top 12-inches of the subgrade to 95% relative compaction unless noted otherwise on the drawings. Recompaction will not be required if rock is exposed at final subgrade.

C. Remove soft material encountered and replace with engineered backfill. Fill holes and depressions to the required line, grade, and cross sections with engineered backfill.

D. If rock is encountered at final grade, over-excavate to a depth of 6-inches and place engineered backfill to establish final grade.

3.08 PREPARATION OF PAVEMENT AND SIDEWALK SUBGRADE

A. Any uncertified fill material encountered within pavement or sidewalk areas should be removed and/or recompacted. The fill material should be moisture-conditioned to near optimum and recompacted to a minimum of 90% maximum dry density. At a minimum the upper 12-inches of subgrade soil shall be scarified, moisture-conditioned and recompacted.

3.09 MOISTURE CONTROL

A. During the compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift of the material. Maintain uniform moisture content throughout the lift. Insofar as practicable, add water to the material at the site of excavation. Supplement by sprinkling the material. At the time of compaction, the water content of the material shall be at optimum water content or within 2 percentage points above optimum. Aerate material containing excessive moisture by blading, discing, or harrowing to hasten the drying process.

3.010 SITE GRADING

A. Perform earthwork to the lines and grades shown in the drawings. Remove exposed roots and loose rocks exceeding 1/4-inches in diameter. Neatly and smoothly trim rounded surfaces.

3.011 PLACING AND COMPACTING AGGREGATE BASE FOR STRUCTURES

A. Material excavated beneath the structure that is not to be replaced with concrete backfill shall be replaced with aggregate base material.

B. Place the aggregate base in 6 to 8-inch lifts and compact to 95% relative compaction unless otherwise noted on the drawings.

3.12 MAINTENANCE

A. Protection of Graded Areas: Graded areas shall be protected and kept free of trash and debris.

B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape and compact to required density prior to further construction.

D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact and replace surface treatment. Restore appearance, quality and condition of surface or finish to match adjacent work and eliminate evidence of restoration to greatest extent possible.

E. Maintain dust control on a continuous basis in accordance with the Standard Specifications.

3.13 EXCAVATION NEAR EXISTING UTILITIES AND STRUCTURES

A. As the excavation approaches pipes, conduits, or other underground structures, not designated for demolition or specifically designated to preserve, discontinue digging by machinery and excavate by means of hand tools. Such manual excavation is incidental to normal excavation and is included in the work to be done under items involving normal excavation.

B. Where determination of the exact location of a pipe or other underground structure is necessary for doing the work properly, excavate test pits to determine such locations. Such test pits are incidental to other excavation, and the work is understood to be included as a part of the excavation.

C. Existing Structures: Support and protect from damage all existing pipes, poles, wires, fences, guard rails, curbing, catch basins, manholes, property line markers, and other structures which do not require temporary or permanent relocation.

D. Restore or replace damaged items, without compensation, to the condition in which they were found immediately before the work under this project was begun.

E. Survey Monuments: Replace survey monuments that are disturbed or removed. Work shall be performed by a Licensed Land Surveyor at the Contractor's expense.

3.14 CARE AND RESTORATION OF PROPERTY

A. General: Do not operate tractors, bulldozers or other power-operated equipment on paved surfaces if the treads or wheels of the equipment are so shaped as to cut or otherwise injure the surfaces.

B. Restore all surfaces, including planted areas, which have been injured by the Contractor's operations, to a condition at least equal to that in which they were found immediately before the work was begun. Use suitable materials and methods for such restoration. Maintain all restored plantings by cutting, trimming, fertilizing, etc., until acceptance. Restore existing property or structures as promptly as practicable and do not leave until the end of construction period.

3.15 EROSION CONTROL

A. Comply with the requirements of the Owner's SWPPP. See Section 01 41 00 – Permits, Fees and Regulations for additional information,

3.16 DUST CONTROL:

A. Take preventative measures to control dust emissions including but not limited to the following:

1. Apply water to all unpaved areas as required to prevent the surface from becoming dry enough to permit dust formation.
2. Keep paved surfaces over which vehicular traffic is permitted to travel free of dirt. In residential areas, use a self-contained, pick-up type, power broom with water distribution system.

B. Temporary suspension of the work, either as a result of order by the Engineer, or as a result of conditions beyond the control of the Contractor shall not relieve the Contractor from his responsibility for dust control as set forth herein.

3.17 COMPACTION:

A. Comply with the compaction requirements are shown on the plans and specified herein.

END OF SECTION

SECTION 31 23 16

TRENCHING, BACKFILL, AND COMPACTION

PART 1 GENERAL

1.1 DESCRIPTION

A. Section includes:
   1. Trenching, backfilling, and compacting for utilities.

B. Related Sections include but are not necessarily limited to:
   1. Section 31 11 00 – Site Clearing, Stripping, and Grubbing
   2. Section 31 23 00 – Earthwork.
   3. Section 31 23 24 – Controlled Low Strength Material

C. For additional information, refer to the Geotechnical Investigation Report (GIR) by Krazan and Associates.

D. Measurement and Payment:
   1. The contract price shall include full compensation for all costs and work involved with trenching, backfilling, and compaction.

1.2 REFERENCES

A. ASTM International (ASTM):
   1. C33– Standard Specification for Concrete Aggregates.
   2. D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).
   3. D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   4. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
   5. D2922 – Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   6. D3017 – Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   7. D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
   8. D4254 – Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

B. Cal-OSHA – Standards and Requirements for Trench Bracing and Shoring.

1.3 DEFINITIONS

A. Pipe Base: The trench area between the bottom of the trench and the bottom of the pipe. Extend full width and length of trench.

B. Pipe Zone: Area of trench between the bottom of the pipe and a minimum of 12-inches above the pipe, unless otherwise indicated. Extend full width and length of trench.

C. Backfill Zone: Area above Pipe Zone.

D. Relative Compaction: Field-measured dry weight expressed as a percent of maximum dry density of same soil determined in accordance with ASTM D1557.

E. Unclassified Excavation: Nature of materials to be encountered is not identified or described.

1.4 DESCRIPTION

A. Provide materials, services, and equipment required for trenching, backfilling and compaction.

B. Trenching and backfilling shall have the approval of the Engineer. Work shall be done only under the general observation and, where required, the detailed inspection of the Engineer. Do not backfill until each specific location is approved.

C. Owner to retain an independent soils laboratory to conduct in-place moisture-density tests for backfilling to assure that all work complies with this Section.

1.5 SUBMITTALS

A. See Section 01 33 00 – Submittal Procedures for general submittal requirements and content.

B. Test Reports: Submit results of independent testing and laboratory specified tests.

PART 2 PRODUCTS

2.1 PIPE BASE AND PIPE ZONE BACKFILL MATERIAL

A. Use sand conforming to ASTM C33 for PVC pipe, polyethylene encased ductile iron pipe, and conduit less than 3-inch diameter.

B. Use crushed, partially crushed, or naturally occurring granular material, free from organic and inorganic debris, liquid limit less than 25, and plasticity index less than 9, that meets the following requirements for underground piping 3-inch or larger diameter, unless otherwise indicated:

Sieve Size	%Passing
Passing 1 inch	100%
Passing ¾ inch	90-100%
Passing ½ inch	30-60%
Passing ⅜ inch	0-20%
Passing No. 4	0-5%

2.2 TRENCH BACKFILL MATERIAL

A. Native material free from organic and inorganic debris and of 3-inch maximum size meeting the requirements of Engineered Backfill specified in Section 31 23 00 – Earthwork.

2.3 CONCRETE FOR TRENCH BACKFILL

A. See Section 31 23 24 – Controlled Low Strength Material.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that native excavated material to be reused as backfill is acceptable to the District Representative.

B. Identify lines and grades.

3.2 REMOVAL OF WATER

A. At all times, provide and maintain means and devices to remove and dispose of water entering trench during preparations for and during pipe laying, and until backfill of the pipe is complete.

3.3 TRENCH EXCAVATION

A. Excavate depth and width as shown or as directed. Allow for cover and pipe base under pipe. Remove loose matter.

B. Comply with CAL-OSHA requirements regarding trench bracing and shoring.

C. If CONTRACTOR elects to slope top of trench in lieu of trench bracing, the trench width shall be maintained at least 2-feet above top of pipe before sloping begins. Sloping, unless otherwise approved by the ENGINEER, shall not be steeper than 1(H):1(V).

3.4 PIPE BASE

A. Provide pipe base for supporting pipe for full width of trench. Unless shown otherwise, minimum depth of pipe base below pipe shall be 4-inches and not less than 3-inches under pipe bell.

B. Hand-grade trench ahead of pipe laying. Provide a firm, unyielding base.

C. If trench is excavated below required depth for pipe base, fill the excess depth with pipe base to proper subgrade. Place pipe base for full width of trench in layers not exceeding 6 inches deep and compact until material does not yield or move.

3.5 PIPE ZONE

A. Use pipe zone material except where concrete-encased or otherwise indicated to be backfilled. Place material simultaneously on both sides of pipe in a manner approved by the ENGINEER. Lifts not to exceed 6-inches.

B. "Walk-in" each lift of backfill. Slice with a shovel or tamp with J-bars or similar devices so that all voids around pipe are filled.

C. Give particular attention to zone from bottom of pipe-to-pipe springline. Ensure firm support to prevent lateral movement or pipe deflection during final backfilling.

3.6 BACKFILL ZONE

A. Place moisture-conditioned backfill material in lifts not exceeding 6-inches for hand operated mechanical compactors and not exceeding 8-inches for heavy equipment compactors.

B. Compact backfill as recommended by the Geotechnical Engineer of the Record.

C. Ponding or jetting will not be permitted.

3.7 TESTING FOR COMPACTION

A. The OWNER will test for compaction as described in Section 31 23 00.

B. Where compaction tests indicate a failure to meet the specified compaction, the OWNER will take additional tests every 15-feet in each direction until the extent of the failing area is identified. Rework the entire failed area until the specified compaction has been achieved.

3.8 FIELD QUALITY CONTROL

A. Perform field testing under provisions of Division 1 – General Requirements.

B. Perform testing as recommended by Geotechnical Engineer.

C. If tests indicate work does not meet specified requirements, remove work, replace, and test.

3.9 COMPLETION REQUIREMENTS

A. Excess materials and waste from earthwork operations shall be disposed of offsite. The OWNER has not determined or secured any sites or permits for disposal of excess material or waste.

END OF SECTION

SECTION 313116
TERMITE CONTROL

PART 1 - GENERAL

1.1 REQUIRED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes soil treatment with termiticide.

1. Extent of application indicated in Part 3 Article “AREA OF APPLICATION.”

1.3 SUBMITTALS

A. Product Data: For termiticide. Include EPA-Registered Label for termiticide products.

B. Qualification Data: For Installer of termite control products.

C. Product Certificates: For termite control products, signed by product manufacturer.

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application.
6. Areas of application.
7. Water source for application.

E. Sample Warranty: For special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination" to schedule application of termiticide products.

1.5 FIELD CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.6 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain termite control products from a single source from a single manufacturer.

2.2 SOIL TREATMENT

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Corporation, Agricultural Products; Termidor.
b. Bayer Environmental Science; Premise 75.
c. FMC Corporation, Agricultural Products Group; Dragnet SFR.

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five (5) years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.

B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 AREA OF APPLICATION

A. Provide Termiticide soil treatment of the following areas:

1. Building Footprint.

3.4 APPLYING SOIL TREATMENT

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

B. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, and piers; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

C. Post warning signs in areas of application.

D. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.5 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

END OF SECTION

SECTION 321373
CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Joint-sealant backer materials.
3. Primers.

B. Related Requirements:

1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of joint sealant and accessory.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1.7 FIELD 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.
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.

PART 2 - PRODUCTS

2.1 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.

2.2 COLD-APPLIED JOINT SEALANTS

A. Cold Applied Joint Sealants: Provide one of the following:

1. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.
    a. Available Product: W.R. Meadows, Inc.; Pourthane SL.
        1) Subject to compliance with requirements, provide product indicated or a comparable product subject to Architect's approval.
2. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 25, for Use T.

a. Available Product: Pecora Corporation; Urexpan NR-200 or DynaFlex.

1) Subject to compliance with requirements, provide product indicated or a comparable product subject to Architect's approval.

B. Joint-Sealant Application: Joints within concrete paving, locations as follows:

1. Expansion and isolation joints in concrete paving.
2. Contraction joints in concrete paving.
3. Other joints as indicated.

C. Joint-Sealant Color: As selected by Architect from Manufacturer's full range.

2.3 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Non-staining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods: ASTM D 5249, Type 1 or Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.4 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints 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.

3.2 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on 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.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint 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 joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact 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.
4. Fill joints to depths shown, or if not shown, as recommended by sealant manufacturer, and equal to 75 percent of joint width, but neither more than 5/8 inch deep nor less than 3/8 inch deep.

E. Tooling of Non-sag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements 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 joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. 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 and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION

SECTION 321613
SIDEWALKS, CURBS, GUTTERS, AND DRIVEWAYS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sidewalks, Curbs, Gutters, and Driveways

B. Related Sections include but are not necessarily limited to:

1. Section 31 23 00 – Earthwork.
2. Section 31 23 16 – Trenching Backfilling and Compaction.
3. Section 31 13 73 – Concrete Paving Joint Sealants.

C. Measurement and Payment:

1. The contract lump sum price for Bakersfield College Agriculture Center shall include full compensation for all costs and work involved to construct or repair sidewalks, curbs, gutters, and driveways.

1.2 REFERENCES

A. Caltrans Standards Drawings.

B. California Test Method 301 – Method Test for R-value Stabil-o-meter.

C. Caltrans Standard Specifications Section 73 “Concrete Curbs and Sidewalks.”

1.3 DESCRIPTION:

A. Work includes all labor, materials, and equipment to furnish, place, finish and cure concrete sidewalks, curbs gutters, and driveways in accordance with these Standard Specifications, the Engineering Improvement Standards, and Sections 52 and 73 of the State of California Standard Specifications.

B. Tolerances:

1. Construct concrete surfaces within ¼-inch of the indicated elevation and deviating not more than 1/8-inch from a 10-foot straightedge placed anywhere on the surface.
2. Slab tolerances shall be “straightedge tolerance” as specified in ACI 117.

1.4 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for general submittal requirements and content.

B. Product Data:

1. Submit data for Concrete Mix.
2. Submit drawings that indicate the section profile of curb and gutter, and the locations of joints in concrete, including construction joints, expansion joints, isolation joints, and contraction joints.
3. Submit drawings of extruded curbs and gutters, if proposed, and any modification of the indicated section profile required by the extrusion process.
4. Submit drawings of reinforcing steel, tie bars, and connecting dowels.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with Caltrans standard, Section 73.

C. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 Portland Cement: Concrete shall be composed of Portland Cement, fine aggregate, coarse aggregate and water, portioned and mixed as specified for “Type II Modified” Portland Cement and mineral admixtures, per Section 90 of the 2010 State of California Standard Specifications.

A. Class 2: Concrete shall contain five hundred ninety pounds (590-lbs) of Portland Cement per cubic yard with one inch (1”) aggregate. Five inch (5”) maximum slump. Three thousand pounds per square inch (3,000-psi) at twenty-eight (28) days for design purpose only.

B. Class 3: Concrete shall contain five hundred and five pounds (505-lbs) of Portland Cement per cubic yard with one inch (1”) aggregate. Four inch (4”) maximum slump. Twenty-eight hundred pounds per square inch (2,800-psi) at twenty-eight (28) days for design purpose only.

C. The Class and minimum compressive strength of concrete shall be Class 3 or as required in the Standard Specifications for the items of work requiring Portland Cement Concrete.

2.2 MATERIALS

A. The materials for manufacturing Portland Cement Concrete shall conform to the following requirements:

B. Arrange with the manufacturer of ready mixed concrete to provide adequate facilities to assure that cement meeting the requirements specified herein will be kept separate from other cement in order to prevent any but specified cement from entering the work.

C. All cement not conforming to the Standard Specifications and all cement contaminated shall be removed immediately and not used in the work.

2.3 WATER

A. In conventionally reinforced concrete work, the water for curing, for washing aggregates, and for mixing shall be free from oil and shall not contain more than 1,000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, nor more than 1,300 parts per million of sulfates as SO4, when tested in conformance with California Test 417.

B. In non-reinforced concrete work, the water for curing, for washing aggregates and for mixing shall be free from oil and shall not contain more than 2,000 parts per million of chlorides as Cl, when tested in conformance with California Test 422, or more than 1,500 parts per million of sulfates as SO4, when tested in conformance with California Test 417.

C. In addition to the above provisions, water for curing concrete shall not contain impurities in a sufficient amount to cause discoloration of the concrete or produce etching of the surface.

D. Water reclaimed from mixer wash-out operations may be used in mixing concrete. The water shall not contain coloring agents or more than 300 parts per million of alkalis (Na2O + 0.658 K2O) as determined on the filtrate. The specific gravity of the water shall not exceed 1.03 and shall not vary more than ±0.010 during a day's operations.

2.4 COARSE AGGREGATE

A. Coarse aggregate shall consist of gravel, crushed gravel, crushed rock, or combination thereof. It shall be free from deleterious coatings, roots, barks, sticks, rags and other extraneous materials.

B. Regardless of source, all coarse aggregate shall be thoroughly and uniformly washed before delivery to the work.

C. Coarse aggregate, when sampled at the batching bin, shall have a cleanness value of not less than eighty-two (82) when subjected to the cleanness test performed in accordance with Test Method No. California 227.

D. Coarse aggregates shall be furnished in the sizes determined in accordance with ASTM C136, as shown in Section 90-3.02 of the Standard Specifications.

E. The maximum size of coarse aggregate shall be as required in these Standard Specifications for the items of work requiring Portland Cement Concrete.

F. Coarse aggregate, when tested for soundness by the sodium sulphate test, ASTM C88, or CA Test Z14, shall lose not more than ten percent (10%) by weight after five (5) cycles.

2.5 FINE AGGREGATES

A. Fine aggregate shall be natural sand, well graded manufactured sand produced from larger aggregate, or a combination of natural and manufactured sand. The aggregate shall be of such character that makes possible the production of a workable concrete within the limits of water content provided in Section 10.05 of the Standard Specifications. It shall be free from deleterious coatings, roots, barks, sticks, rags, and other extraneous material.

B. When testing in accordance with the test method of ASTM C40, fine aggregate shall not indicate a color darker than the reference standard color solution unless it is determined by the Engineer that a darker color is acceptable.

C. Fine aggregate shall also comply with the requirements of Section 2-2.02B of the Standard Specifications.

D. Fine aggregate shall be well graded and shall range in size uniformly within the limits of Section 90-3.03 of the Standard Specifications when tested in accordance with ASTM C136.

2.6 EXISTING CURBS, GUTTERS, AND VALLEY GUTTERS

A. Where the approved Construction Drawings provide for the reconstruction of a portion of an existing curb, gutter, valley gutter, or sidewalks, the existing section shall be cut to a minimum depth of one and one-half inches (1½”) with an abrasive type saw at the line shown in the approved Construction Drawings or as determined by the Engineer, and the entire section to be reconstructed shall be removed. Saw cuts shall also be of sufficient depth to leave an even, straight line. The new curb, gutter, valley gutter, sidewalk or mow strip shall join the original at this line with a two-inch by two-inch (2” x 2”) shovel footing under the existing concrete structure or doweled as directed by the Engineer. Full compensation for the removal and disposal of existing concrete improvements shall be included in price bid.

2.7 CONSTRUCTION OF CONCRETE IMPROVEMENTS

A. Curbs, gutters and cross gutters conform to Section 73 of the State of California Standard Specifications and Standard Drawings

B. Extruded curb and gutter shall be constructed with Class 3 concrete.

2.8 READY-MIXED CONCRETE

A. Ready mixed concrete shall be delivered to the job site of the work and discharge shall be completed within one and one-half (1½) hours after the addition of the cement to the aggregates or before the drum has been revolved two hundred fifty (250) revolutions, whichever comes first. In hot weather or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall be less than one and one-half (1½) hours, as directed by the Engineer, except that concrete shall not be discharged once the temperature of the concrete has reached eighty-five degrees Fahrenheit (85 °F).

B. Should water be added at the job site, the drum shall be revolved a minimum of twenty-five (25) revolutions after the introduction of such water.

C. The maximum size of coarse aggregate shall be as required in these Standard Specifications for the items of work requiring Portland Cement Concrete.

2.9 ADMIXTURES

A. No admixture shall be used without written permission from the Engineer or unless elsewhere provided for in these Standard Specifications or in the Special Provisions.

B. Calcium Chloride: When the use of calcium chloride is permitted or is specified in the Special Provisions, the calcium chloride shall conform to the specifications of ASTM D98.

C. Air-Entraining Agent: When the use of an air-entraining agent is permitted, or is specified in the Special Provisions, it shall be added at the rate designated by the Engineer to result in an air content of five percent (5%) + or – 1.5% by volume in the freshly mixed concrete.

2.10 WATER REDUCING ADMIXTURE

A. Type A or F, water-reducing; Type B, retarding; or Type D or G, water-reducing and retarding admixtures as described in ASTM C494 may be used to conserve cementitious material or to facilitate any concrete construction application subject to the following conditions:

1. When a water-reducing admixture or a water-reducing and retarding admixture is used, the cementitious material content specified or ordered may be reduced by a maximum of 5 percent by weight, except that the resultant cementitious material content shall be not less than 505 pounds per cubic yard.
2. When a reduction in cementitious material content is made, the dosage of admixture used shall be the dosage used in determining approval of the admixture.

B. Unless otherwise specified, a Type C accelerating chemical admixture conforming to the requirements of ASTM C494, may be used in Portland cement concrete. Inclusion in the mix design submitted for approval will not be required provided that the admixture is added to counteract changing conditions that contribute to delayed setting of the Portland cement concrete, and the use or change in dosage of the admixture is approved in writing by the Engineer.

2.11 AMOUNT OF WATER AND SLUMP TEST

A. The amount of water required for the proper consistency of concrete shall be determined by means of the Slump Test made in accordance with the Standard Method of Slump Test for Consistency of Portland Cement Concrete of the AASHO Serial Designation: T-1 19-42 with subsequent amendments.

B. The amount of slump shall be twelve inches (12”) minus the height after subsidence. The allowance for slump shall be as follows:

1. Cast-in-place pipe and concrete paving - not more than three inches (3”).
2. All concrete structures - not more than three inches (3”).
3. Concrete curbs and gutters - not more than five inches (5”).

C. The amount of water used shall not exceed six and one-half gallons (6½ gal.) including moisture in the aggregate, per sack of cement for Class 2 concrete, and seven gallons (7-gal.) per sack of cement for Class 3 concrete.

2.12 PROTECTING CONCRETE

A. Concrete for structures shall not be placed on frozen ground nor shall it be mixed or placed while the atmospheric temperature is below thirty-five degrees Fahrenheit (35 °F), unless adequate means are employed to heat the aggregates and water, and satisfactory provisions have been made for protecting the work. Provisions satisfactory to the Engineer shall be taken to protect concrete about to be poured when there is danger of temperature dropping below thirty-five degrees Fahrenheit (35 °F) within the next twenty-four (24) hours. Concrete damaged by frost action shall be replaced at no additional cost to the OWNER. Concrete shall not be placed when the atmospheric temperature in the shade in the vicinity of the work exceeds ninety-five degrees Fahrenheit (95 °F), or when the temperature of the concrete exceeds eight-five degrees Fahrenheit (85 °F).

B. Structure concrete and shotcrete used as structure concrete shall be maintained at a temperature of not less than 45 °F for 72-hours after placing and at not less than 40 °F for an additional 4 days. When required by the Engineer, the CONTRACTOR shall submit a written outline of the proposed methods for protecting the concrete.

C. All surfaces against which concrete is to be placed shall be free from standing water, mud, debris, and shall be firm enough to prevent contamination of the concrete by earth or other foreign material.

D. Absorptive surfaces against which concrete is to be placed shall be moistened thoroughly so that moisture will not be drawn from the freshly placed concrete.

2.13 FORMS

A. Forms shall be smooth, mortar tight, true to the required lines and grades, and of sufficient strength to resist springing out of shape during the placing of the concrete. All dirt, chips, sawdust, nails, and other foreign matter shall be completely removed from the forms before any concrete is deposited therein. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being reused. Before concrete is placed in forms, all surfaces against which the concrete will be placed shall be thoroughly coated with form oil.

B. Prior to placing concrete, check all forms for alignment and grade. Forms, reinforcing steel, or earth surfaces to receive concrete shall be wet prior to concrete placement.

2.14 CURING CONCRETE

A. When maximum daytime temperature exceeds fifty degrees Fahrenheit (50 °F) all newly placed concrete shall be sprayed uniformly with a curing compound. Curing

compound shall be applied at a nominal rate of one gallon per one hundred fifty square feet (1 gal/150 ft²), unless otherwise specified. Immediately after finishing, the exposed exterior surfaces of the concrete shall be cured by either the water method, pigmented curing compound method, or the waterproof membrane method, in accordance with Section 90-7, “Curing Concrete” of the State of California Standard Specifications, except for cast-in-place concrete pipe for which only the waterproof membrane method shall be used as provided in Section 17-05.i of the Standard Specifications.

2.15 VIBRATOR

A. Whenever a structure requiring reinforcement is to be constructed, provide one (1) or more portable vibrating machines to be used on such structures as directed by the Engineer. Full compensation for providing vibrating machines shall be considered as being included in the price bid.

2.16 CEMENT MORTAR

A. Cement mortar shall be composed of one (1) part Portland Cement and two (2) parts of clean, well-graded sand of such a size that it will pass a number eight (#8) sieve. An admixture of hydrated lime, fire clay or diatomaceous earth may be used in the mortar to facilitate workability, and the amount of such material used will be limited as ordered by the Engineer. Quick setting cement may be used when necessary to facilitate the early backfilling of trench.

B. No mortar shall be used in which water has been added to the dry ingredients for a period of over thirty (30) minutes.

2.17 CEMENT REQUIREMENTS

A. Concrete compressive strength requirements shall be the minimum strength at the age of twenty-eight (28) days as required in these Standard Specifications for the items of work requiring Portland Cement Concrete. The compressive strength of concrete will be determined from test cylinders which have been fabricated from concrete sampled and made in accordance with the Standard Specifications and with ASTM C31. Cylinders shall be tested in accordance with ASTM C39. Should the concrete used in the work fail to meet the minimum strength requirements as specified for the items of work, the Contractor shall, at his expense, make corrective changes in the material mix proportions or in the concrete fabrication procedures, before placing additional concrete.

B. In addition to the aforementioned requirements, all such concrete represented by test cylinders which indicate strength of less than the specified strength for the item of work will be rejected in accordance with the provisions of Section 6.04, “Defective Materials” of the Standard Specifications. Such rejection shall prevail unless the Contractor, at his expense, obtains and submits evidence of a type acceptable to the Engineer that the strength and quality of the concrete placed in the work are acceptable, or undertakes remedial action to correct the deficiency in a manner acceptable to the Engineer.

PART 3 EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Excavate for and prepare the sub grade as specified in Section 31 23 00 - Earthwork, true to the indicated grade and cross section.

B. Test completed sub grade for correct grade and cross section by means of template supported on side forms.

C. Dampen sub grade and forms just before placing concrete.

3.2 TYPES OF CONSTRUCTION

A. Provide cast-in-place concrete construction, plain or reinforced as indicated. Curbs and gutters shall be formed accurately to indicate section profile with template screed.

B. Extruded curbs and gutter, placed by an extrusion machine, may be provided where site conditions are suitable, and the extrusion process is appropriate for the purpose.

3.3 JOINTS

A. Expansion Joints:

1. Construct 3/8-inch to 1/2-inch thick expansion joints in the following locations:
    a. In curb and combination curb and gutter at the locations of expansion joints in the concrete roadway.
    b. In curb or combination curb and gutter, at points where curved and tangent sections join.
    c. Between curb or combination curb and gutter, and any drain inlet or similar structure occurring within the limits of the curb or combination curb and gutter.
    d. At corners in sidewalks, following the projections of the building lines from the corner of the building to the curb.
    e. Between sidewalks and any permanent structure.
    f. Between sidewalk and curb.
    g. Through sidewalks at intervals not greater than 15-feet.
    h. Construct expansion joints as specified in the construction plans, except that load transfer devices will not be required unless indicated. Shape preformed filler to cross section of curbs and combination curb and gutter.

B. Contraction Joints: In sidewalks, provide contraction joints as indicated in uniform intervals not greater than 6 feet, with the edges rounded to a 1/4-inch to 3/8-inch radius.

C. Tooling: Finish joints with an edging tool having 1/4-inch to 3/8-inch radius, leaving joints free of mortar and concrete. In preformed type joints, leave joint filler material exposed for full length of joint with clean and true edges.

D. Joint Sealing:

1. Seal to within 1/8-inch of pavement surface joints in curbs and gutters, including gutter surfaces of combination curb and gutter sections; all joints between curbs and vehicular pavement; all joints between gutters and vehicular pavement; and all other expansion joints.
2. Do not seal joints until concrete curing is complete. Prior to installation of the joint sealing compound, clean the joints of dirt and other foreign material. Joints may be cleaned with compressed air jets provided that the air in such jets is free of oil or water. Do not fill joints when there is any free water in or adjacent to the joints. Joint walls and all surfaces to which the sealing material is to adhere shall be surface dry for at least three hours prior to sealing.
3. Apply with approved pressurized equipment. Perform sealing of joints to make them impervious to water and to prevent the sealing compound from spreading over the surface of the pavement.

E. Form Removal:

1. Remove front curb forms not less than two or more than six hours after placing concrete, but in no case while the concrete is still plastic enough to slump.
2. Remove other forms not less than twelve hours after finishing is completed.

3.4 FINISHING

A. General:

1. Keep the curb face wet during above finishing operations.
2. Allow no coarse aggregate to show on the finished curb surface.

B. Curb and Combination Curb and Gutter:

1. Trowel the face of curb smooth to a depth of not less than 2-inches below the flow line, or to the flow line of integral curb and gutter, and finish with a steel trowel, all immediately after removal of front curb forms.
2. Finish all curb edges with a radius of 1/2-inch.
3. Provide a final fine brush finish to both top and face of curb with brush strokes parallel to the line of the curb, so that both top and front face present the same uniform appearance.

C. Ramps and Driveways:

1. For pedestrian and wheelchair ramps, and all other surfaces where the Contract Drawings require a non-slip finish, provide a "nonslip finish" in combination with a "floated finish" or "broom finish" in accordance with the requirements of ACI 301.
2. Broom finish shall be applied perpendicular to the direction of traffic flow.
3. Finish all edges with a radius of ¼-inch to 3/8-inch.

3.5 CURING AND PROTECTION

A. Comply with the applicable requirements of the Caltrans' Standards, for curing concrete with liquid membrane-forming curing compound. Do not permit traffic on new concrete pavement until the concrete has cured a minimum period of ten days.

B. Provide damp curing only, in accordance with Caltrans' Standards, for concrete slab surfaces indicated to be treated with concrete hardener and dust proofer.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform inspections and tests as specified in Caltrans' Standards for Portland Cement Concrete.

END OF SECTION

SECTION 323300
SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Manufactured site furnishings as follows

1. Waste receptacles.
2. Provide (2) waste receptacles per the specification section. locations shall be coordinated with the Owner during construction

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, including assembly and installation instructions.

B. Shop Drawings: Show fabrication and installation details for site furnishings.

C. Samples for Initial Selection: For products involving selection of color.

D. Maintenance Data:

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store site furnishings in manufacture’s unopened packaging until ready for installation and protected from weather, moisture, soiling, abrasion, and humidity.

1.5 COORDINATION

A. Coordinate installation of anchorages for site furnishings. 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.

PART 2 - PRODUCTS

2.1 WASTE RECEPTACLES

A. Basis of Design: Drawings and specifications are based on the following:

1. Dawn Enterprises

a. Subject to compliance with requirements, provide product indicated or a comparable product:

B. Description:

1. Material: Stone Aggregate
2. Size: 16 inches square by 32.5 inches high.
3. Capacity: 35 Gallon
4. Finish: Factory Finish.
5. Color: As selected by Architect from manufacturer’s full range.

2.2 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install site furnishings in accordance with manufacturer’s written installation instructions and as indicated on Drawings.

B. Provide anchorage devices and fasteners where needed to secure site furnishings to in-place construction.

C. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.

D. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 CLEANING AND PROTECTION

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

B. Protect finishes from damage during construction period with temporary protective coverings. Remove protective covering at time of Substantial Completion.

C. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 323313
BICYCLE RACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Manufactured site furnishings as follows

1. Bicycle racks for short-term parking.
2. Provide (1) bicycle rack and (1) lockable two-bicycle rack. Locations shall be coordinated with the Owner during construction.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, including assembly and installation instructions.

B. Shop Drawings: Show fabrication and installation details for site furnishings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store site furnishings in manufacture's unopened packaging until ready for installation and protected from weather, moisture, soiling, abrasion, and humidity.

1.5 COORDINATION

A. Coordinate installation of anchorages for bike racks. 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. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 BICYCLE RACKS

A. Basis of Design: Drawings and specifications are based on the following:

1. Furphy Foundry; FFSC010006 Spiral Rack.

a. Subject to compliance with requirements, provide product indicated or a comparable product by one of the following:

1) BC Site Service; Nikls Group.
2) Huntco Site Furnishings, LLC.
3) SiteScapes, Inc.
4) L.A. Steelcraft Products.

B. Description: Spiral style, bent steel pipe bicycle rack as follows:

1. Material: Schedule 40 steel pipe, 2 inch diameter (2.375 inch outside diameter).
2. Bicycle Capacity: 4-6-8-10 bikes.
3. Height: 31 inches nominal (Installed height).
4. Finish: Galvanized after fabrication.
5. Anchorage Method: In-ground (embedded).

2.2 FERROUS METALS

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).

B. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

C. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.

C. Provide tamper-resistant screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion type or chemical type and as indicated on Drawings.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.4 FABRICATION, GENERAL

A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

B. Fabricate bends in pipe by hydraulic bending with a mandrel.

C. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

2.5 STEEL FINISHES

A. Galvanizing: Hot-dip galvanize products made from rolled, pressed, and forged steel shapes, castings, plates, bars, and strips indicated to be galvanized to comply with ASTM A 123/A 123M.

1. Hot-dip galvanize steel and iron hardware indicated to be galvanized to comply with ASTM A 153/A 153M.
2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install bicycle racks in accordance with manufacturer’s written installation instructions and as indicated on Drawings.

B. Provide anchorage devices and fasteners where needed to secure site furnishings to in-place construction.

C. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.

3.3 CLEANING AND PROTECTION

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

B. Protect finishes from damage during construction period with temporary protective coverings. Remove protective covering at time of Substantial Completion.

C. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION

SECTION 328400
LANDSCAPE IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all materials, labor, equipment and services necessary to furnish and install Landscape Irrigation System, accessories and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded. The extent of the underground landscape irrigation system is shown on the drawings. The Contractor shall carefully review the plans and specifications and if they feel that more equipment is needed, they shall include that in the bid. All extra work to achieve full coverage shall be at the Contractors expense. Sprinkler systems shall be complete, operative and automatic and provide full coverage of the planted areas.

B. Irrigation systems shall be constructed to the sizes, grades and locations shown on the plans. Irrigation pipelines shown on the plans are essentially diagrammatic. Locations of all irrigation improvements shall be established by the Contractor at the time of construction. Typical spacing of the sprinklers are shown on the plans and shall not be exceeded, except by written permission of the Owner's authorized representative.

C. The system has been designed to a pressure as indicated in these specifications. The Contractor shall test the mainline prior to starting any work and verify that such pressure does exist. If it does not, the Contractor shall notify the Owner at once for a ruling before starting work. If the Contractor does not test prior to starting work, all corrective work shall be at the Contractors expense.

1.2 RELATED SPECIFICATION SECTIONS

Division 31	EARTHWORK
32 9000	LANDSCAPE CONSTRUCTION
Division 03	CONCRETE
Division 26	ELECTRICAL

1.3 STANDARDS

A. Materials and installation shall conform to all State and Local codes and regulations governing the trades included in this work. Requirements of these plans and specifications not conforming therewith, but exceeding code requirements, then the plans and specifications shall govern.

1.4 EXPLANATION AND EXAMINATION OF SPECIFICATIONS AND PLANS

A. Due to the scale of the Drawings, it is not possible to indicate offsets, fittings, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of their work and plan their work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed in the most direct and workmanlike manner so that conflicts between irrigation systems, planting, utilities, and architectural features will be avoided.

B. Notes on Drawings: Work called for on the Drawings by notes shall be furnished and installed whether or not specifically mentioned in the Specifications.

C. It shall be the responsibility of the Contractor to carefully examine the site, plans and specifications relating to this work for completeness, accuracy and clarity. Any conflict, error, or clarification shall be immediately brought to the attention of the Owner's authorized

representative in writing to obtain a ruling. Failure to do so prior to bidding shall result in any corrective work necessary shall be completed at the Contractor's expense.

D. It is the intent of these specifications and plans to form a guide to accomplish the work of installing a complete sprinkler system which will operate in an efficient and satisfactory manner according to the workmanlike standards established for the irrigation industry. Therefore, any items not specifically noted, but necessary for a complete installation, shall be furnished and installed under this contract.

E. Manufacturer printed instructions shall also be a part of these specifications and shall prevail over these specifications. The Contractor shall be responsible to provide such details and instructions to the inspecting person for approval or rulings.

F. All general and specific notes shown on the drawings and details herein shall take precedence over these specifications. All work designated on the drawings by notes shall be furnished and installed.

1.5 PERMITS AND INSPECTIONS

A. The Contractor shall obtain and pay required fees to any governmental or public agency. Permits for the installation or construction of the work included under this Contract, which are required by legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. The Contractor shall also arrange for and pay costs in connection with inspections and examination required by these authorities.

1.6 GUARANTEE

A. Irrigation system shall be guaranteed for a period of one year from the date of final acceptance. Any repairs required are to be completed by the Contractor in a timely manner at no additional cost to the Owner.

1.7 OPERATIONS AND MAINTENANCE INSTRUCTIONS / RECORD DOCUMENTS

A. Two copies of equipment operations, maintenance instructions, and wire diagrams shall be furnished to the Owner prior to final acceptance. Two copies of control valve station charts (color coded reduced Irrigation Plan with plastic waterproof lamination) showing watering zones and stationing shall be provided and mounted in the controller pedestal.

B. The Contractor shall furnish one set of reproducible Record Documents (As-Built drawings) in form of 24 lb bright white bond paper.

1. Label first page of each document, or set of documents, "RECORD DRAWINGS" in neat large printed letters on lower right hand corner. Record information concurrently with construction progress. Do not conceal any work until required information is recorded on a daily basis.

2. Drawings: Legibly mark to record actual construction:
   a. Horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements. Give sufficient horizontal and vertical dimensions to accurately trace route and invert of each concealed line or item. Accurately locate each capped, plugged, or stubbed line.
   b. Field changes of dimension and detail.
   c. Changes made by Field Order, by Addenda, or by Change Order.
   d. Details not on original Contract Drawings.

3. Deliver all Record Documents (As-Builts) to Landscape Architect. Accompany submittal with transmittal letter in duplicate, containing:
   a. Date.
   b. Project title.
   c. Contractor's name and address.
   d. Title and number of each Record Document (As-Built).
   e. Signature of Contractor or his authorized representative.

1.8 SUBMITTALS

A. Within the required time period stated in the General Provisions, the Contractor shall submit six (6) copies of complete lists of proposed materials to Landscape Architect including manufacturer's name and catalog numbers.

B. Shop drawings shall follow (six copies) for equipment including dimensions, capacities, and other characteristics listed in product specifications. Materials and equipment shall not be ordered until given written approval by Landscape Architect.

1.9 DEFINITIONS

A. Piping: All pipe fittings, valves, and accessories as required for a complete piping system.

B. PVC: Polyvinyl Chloride.

C. Agencies and Organizations:

1.	ASTM	American Society for Testing and Materials
2.	AWWA	American Water Works Association
3.	IAPMO	International Association of Plumbing and Mechanical Officials
4.	CEC	California Electrical Code
5.	UL	Underwriter's Laboratories

1.10 UNDERGROUND OBSTRUCTION

A. The Contractor shall verify all underground obstructions, and / or utilities, existing or proposed, prior to trenching. Contractor shall avail themselves of any “as built” drawings of the site, Underground Service Alert (USA) 1-800-227-2600 and records of existing and proposed site work. This shall also include verifying between proposed irrigation work and existing / proposed underground utilities. Contractor shall call for a ruling by the Owner’s Authorized Representative prior to work to obtain a ruling in the event of a conflict.

B. The Contractor, after availing themselves to the existing record drawings, Underground Service Alert and coordination with other trades installing underground utilities and excavation operations incurs and damages any existing utility not identified, the Contractor shall stop work and notify the inspector on site, obtain a ruling and repair the damage.

1.11 WORKMANSHIP

A. The Contractor shall have experience and demonstrated ability in the installation of irrigation systems of this type. No work shall be completed without supervision. All work shall be installed by skilled persons proficient in the trades required, in a neat, orderly and organized

manner, with the recognized standards of craftsmanship developed for the industry and as described in the plans, specifications and manufacturers installation instructions.

1.12 PROTECTION TO THE PUBLIC HEALTH AND WELFARE

A. The Contractor in the course of their work shall make every effort to guard the public health, safety and welfare during construction. This shall include erection of barricades, night warning lights and all necessary devices required to protect the public health and welfare or as required by existing governmental codes. The Contractor shall accept any and all liabilities arising from accident or injury on the job and after construction. All equipment which protrudes above grade shall be installed against a structure or an appropriate barricade shall be erected to protect public safety.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials and equipment to be used shall be as outlined on the irrigation legend, or as described in the irrigation notes and irrigation specifications. All materials shall be new and unused.

B. All specified materials, products and manufacturers are relevant to describe the required quality and features of a particular component of the irrigation system, however, the specific product or manufacturer noted is to be construed to be followed by the words, “or approved equal”.

2.2 PIPELINES / SLEEVES

A. Irrigation Piping:

1. 2" thru 3": Pressure pipe / upstream of control valve (mainline pipe): PVC Schedule 40 solvent weld pipe, PVC Material ASTM D1784, Cell Class 12454B, Pipe Design ASTM D1785 & compliance with all NSF & IAPMO (UPC) requirements.

2. 4” thru 6”: Pressure pipe / upstream of control valve (mainline pipe): PVC Class 200 gasketed pipe, pressure rating 200 psi, SDR 21, PVC Material ASTM D1784, Cell Class 12454B, Pipe Design ASTM D2241 & Gasket Material ASTM F477.

3. 1" thru 2 1/2": Circuit pipe / downstream of control valve (lateral pipe): PVC Class 200 solvent weld pipe, pressure rating 200 psi, SDR 21, PVC Material ASTM D1784, Cell Class 12454B & Pipe Design – SDR Pipe ASTM D2241.

4. 2" and larger: Sleeving under hardscape / paving: PVC Schedule 40 solvent weld pipe, pressure rating varies, PVC Material ASTM D1784, Cell Class 12454B & Pipe Design ASTM D1785.

5. Pipe shall be continuously and permanently marked with the following information: Manufacturer's name or trademark, nominal pipe size, schedule and type of pipe, pressure rating in PSI and (NSF, IAPMO & AWWA) seals of approval.

B. Plastic pipe shall be as called for on the plan and extruded from PVC 1120/1220 and shall meet commercial standards CS 256-63. Class and schedule of pipe shall be as called for in the plans. Strict conformance with the manufacturers recommended installation instructions is required. Painted galvanized steel (schedule 40), threaded bronze nipples, copper or painted

ductile iron pipe is to be used for any pipe installed above grade. Fittings for above grade piping are to be consistent with pipeline material. Sun burned pipe or pipe that has been abused in shipping and handling is not to be used.

C. The Contractor is to install concrete thrust blocks as outlined in the thrust block detail and as recommended by the pipe & fitting manufacturers to secure all changes in direction or dead ends of all mainline pipe. The Contractor is to use rebar as needed if necessary to insure the stability of the pipe. Where concrete thrust blocks cannot be installed against continuous native subgrade, the Contractor is to install ductile iron mechanical joint restraints. No bending, or curving of pipe will be allowed, except as permitted by the pipe manufacturer. Pipe manufacturer must be approved prior to ordering materials.

D. Where piping on the plans is shown under paved areas, but is running parallel and adjacent to planted areas, the intent of the plans is to install the piping in the planted area. PVC Class 200 sleeves are to be used with all pipe and wire installed under hardscaped surfaces over six feet (6'-0") wide or wider.

E. Where pipeline routing changes occur in the field, the Contractor is to size the pipe so that a flow velocity of 4.0 feet per second is NOT exceeded. The minimum pipe size is 1" and 3/4" and 11/4" pipe is not used due to its limited flow range. The following is a basic guide for sizing lateral pipes in the field:

1. 3/4" Pipe – Not Used
2. 1" Pipe - 0 gpm thru 16.0 gpm
3. 11/2" Pipe - 16.1 gpm thru 36.0 gpm
4. 2" Pipe - 36.1 gpm thru 55.0 gpm
5. 21/2" Pipe - 55.1 gpm thru 89 gpm

2.3 PIPELINE FITTINGS

A. Fittings:

1. For PVC solvent weld plastic pipe, 2" thru 3" mainline fittings: PVC Schedule 80 socket fittings (ASTM A2564, D2466, D2464 & D2467), Type 1, Grade 1. All mainline fittings are to be PVC Schedule 80 type with solvent weld or threaded connections.

2. For PVC class 200 gasketed pipe, 4” thru 6” mainline fittings: Ductile iron deep bell gasketed fittings as manufactured by LEEMCO, MegaLug or approved equal. See manufacturers instructions and recommendations. No angular deflection of mainline pipe at the fitting bell end is allowed. For automatic valve connections to large mainline (4” thru 6”) pipe, Romac 202N ductile iron service saddle with double stainless steel straps may be used.

3. For PVC solvent weld plastic pipe, 3/4" thru 21/2" lateral fittings: PVC Schedule 40 socket fittings (ASTM A2564, D2466, D2464 & D2467), Type 1, Grade 1. All lateral fittings (downstream remote control valve) not specifically noted as PVC Schedule 80 type in the specifications or irrigation details are to be PVC schedule 40 type with solvent weld or threaded connections.

4. For connections between mainlines and remote control valves: Schedule 80 PVC fittings and nipples (threaded both ends), or Schedule 80 TOE nipple may be used, see Irrigation Details.

5. When connection is plastic to metal, Schedule 80 TOE nipple shall be used.

6. Teflon tape shall be used on all small diameter (½" to 3") threaded connections. No liquid or paste pipe thread sealants are allowed.

B. Risers to irrigation heads: Shall be as noted on Irrigation Details.

C. Solvent Weld Adhesive: Weld-On cement & primer appropriate for size & type of pipe and fittings. See manufacturer's instructions and recommendations. Note weather and temperature limitations for use. Use primer for all joints, mainline and lateral pipe connections.

2.4 VALVES / CONTROL WIRE

A. Automatic Control Valves: Globe / Angle valves operated by low-power solenoid, normally closed, with manual flow adjustment. Sizes and types as shown on drawings. Low voltage electrical connections to valves shall have a minimum 24" coiled loop to each valve in valve box, see details. Valves shall be installed in a heavy duty plastic valve box with bolt down lid. Install one valve per valve box, no exceptions.

B. Low Voltage Control Wire: Single strand Copper, UL approved for direct burial, minimum size #14-1 (hot wires) & #12-1 (common wires) rated for 600 volts as manufactured by Paige Electric, or approved equal. Common wire to be white/green, control wire to be red/yellow, spare hot to be black, spare common to be blue. All low voltage valve wiring is to be installed adjacent to pipe and taped into bundles at ten (10'-0") foot intervals. Wiring is to be neatly organized and loosely laid in trench and not stretched or pulled tight with expansion coils (30") at all changes in direction. All low voltage "hot" wiring is to be continuous, between the valve location and the irrigation controller. Low voltage wire shall be color coded by controller. Contractor is to install a minimum of one spare hot wire and one spare common wire per controller looped to all remote control valves. Spare wires are to be color coded per controller.

C. Waterproof Splice Kits: Valve to low voltage control wire connectors to be 3M DBY / DBR Direct Bury splice kits are to be used for all wire connections and spare wire ends. All splices are to be located in a valve box and no direct bury splices are allowed.

D. Control Wire Marking: T. Christy Enterprise, Inc. Waterproof Irrigation I.D. Tag or approved equal (714) 771-4172.

E. Control Valve Boxes: Christy heavy duty plastic valve boxes with heavy duty bolt down lids, or approved equal. See Irrigation Details for model numbers and sizes.

F. Control Valve Box Marking: Heat imprinted or engraved with appropriate controller and station number.

2.5 IRRIGATION HEADS

A. Spray Head: Molded plastic body with plastic nozzles. Refer to schedule on drawings. Manufacturer's numbers are listed with description.

B. Rotor Head: Molded plastic and stainless steel construction. Gear driven with lockable arc adjustment and matched precipitation rate nozzles. Refer to schedule on drawings. Manufacturer's numbers are listed with description.

C. Irrigation heads adjacent to concrete walks, mow strips or other paved areas shall be offset 3" to permit edging without damage to irrigation equipment. Irrigation heads are to be set at grade. Irrigation heads are to be adjusted so that no spray hits buildings, fences, walls, or hardscaped surfaces. Install anti-drain check valves under all irrigation heads that weep or show drainage after operation.

2.6 GATE VALVES

A. 1" thru 3" Size, if required: Class 125 bronze gate valve, 200 psi WOG, manufactured domestically made of cast bronze material and cross handle with non rising stem as manufactured by NIBCO, or approved equal. Solid wedge with screw in bonnet gate valve with threaded connections resistant to dezincification.

B. 4" thru 6” Size, if required: Resilient seat ductile iron gasketed joint gate valve rated for a minimum of 200 psi, manufactured domestically by NIBCO, Waterous or approved equal.

2.7 QUICK COUPLER VALVES

A. Two piece valve with heavy duty brass construction with vinyl cover and single lug operation. Contractor is to supply Owner with three (3) quick coupler keys and three (3) hose swivels. See Irrigation Legend and Details for detailed descriptions.

2.8 CENTRAL CONTROL SYSTEM

A. Not used on this project.

2.9 HAND HELD RADIO SYSTEM

A. Provide one (1) hand held maintenance radio kit (Rainmaster #PROMAX-UA) with charger and carrying case to the District capable of remote activation of the irrigation system for maintenance purposes.

2.10 FIELD SATELLITE CONTROLLER

A. Field satellite controller shall be as specified on the plans. Pedestal mount shall have a concrete base. The installation shall be in accordance with the manufacturers instructions and recommendations. All electrical connections to the controller shall be the responsibility of the Contractor and shall be UL approved and meet all applicable codes and regulations. All wiring from the electrical source to controller shall be installed in UL approved electrical conduit.

2.11 IRRIGATION BOOSTER PUMP STATION

A. Irrigation booster pump is existing and is to remain and protect.

2.12 VALVE BOXES

A. All valves, manual or automatic shall have a valve box, set flush with grade. All valve boxes shall be of heavy duty plastic construction with heavy duty bolt down lids. Valve boxes are to be manufactured by Applied Engineering, or approved equal. Maximum of one (1) valve per valve box, no exceptions. Placement of the valves within the valve boxes shall allow for proper servicing and maintenance space, or the installation will be rejected.

2.13 AIR RELIEF VALVES

A. Air relief valves shall be installed at high elevation areas of the mainline pipe and at dead end runs. Air relief valves are to be located in the field where high elevation points can be

determined. Contractor is to submit a shop drawing showing the proposed installation locations for review and approval.

2.14 BACKFLOW PREVENTION DEVICES

A. Backflow prevention devices are existing and are to remain and protect.

2.15 OTHER MATERIALS

A. Materials not specifically indicated but necessary for proper execution of this work shall be of the first quality as selected by the Contractor subject to the acceptance of Architect.

B. All materials appearing in the legend and details of the irrigation drawings are part of this job. Contractor is responsible for installation according to drawings and details. The system shall efficiently and uniformly irrigate all areas and perform as required by these plans and specifications.

PART 3 - EXECUTION

3.1 IRRIGATION SYSTEM DESIGN

A. Irrigation system is designed for a water pressure of 55 psi at the irrigation point of connection.

B. Verify the design pressure provided at the irrigation point of connection prior to system modifications and report any discrepancies in writing to the Architect. Failure to inform the Architect of any discrepancy in design pressure seven working days prior to installation of the irrigation system shall institute the responsibility of corrective action to the Contractor, at no expense to the Owner.

3.2 IRRIGATION STAKING

A. The location of all sprinklers, valves, piping and other irrigation improvements shall be staked out by the Contractor. All staking and measurements shall be taken from permanent objects, buildings, or other permanent hardscape features including survey bench markers, and are NOT to be taken from non-permanent boundaries such as turf boundaries which are subject to modification. All measurements shall be made in feet and inches, rounding to the nearest inch. All variations from the plans are to be continuously updated on a daily basis on the record (as built) drawings. The Contractor is to present the areas staked to the Landscape Architect for review and approval prior to starting work. The Contractor is to make the adjustments in staking requested by the Landscape Architect at no additional cost to the Owner.

B. In planter areas, the Contractor is to stake the tree and shrub locations prior to layout of the irrigation system to get approval from the Landscape Architect in the field prior to trenching. Contractor is to use color coded flags to stake plant materials by variety. Landscape Architect may move plants, delete or add plants during the staking review process. Contractor is to make changes in the field and on the as built plans at no additional cost to the Owner. After the plant layout has been staked, reviewed, adjusted and approved, the Contractor is to stake the bubbler locations for each plant or tree. Bubblers are to be located within the plant water basin on the uphill side of the plant or tree. Bubblers that are too far from the plant or tree will need to be relocated within an acceptable difference. The plant or tree rootball is to have direct access to irrigation water from the intended bubbler. Sloppy or non-compliant work will be rejected.

3.3 EXCAVATION, BACKFILL

A. Trenches for irrigation pipelines and sleeves shall be excavated either by hand or machine and shall be of sufficient width to permit proper handling and installation of the pipe and fittings. The backfill shall be compacted and evened off with the adjacent soil level. Select fill material or sand shall be used if soil conditions are rocky or have debris. No material over 3/8" shall be allowed near the pipe, 6" below it, or 6" above the pipe. Backfill shall be made early in the morning when the soil and pipe temperatures are the same. Pipe to be installed with a minimum cover of 18" for mainline pipe and 12" for lateral pipe with spray heads and 18" for lateral pipe with rotors. Backfill shall be in 6" (lifts) increments. Each (lift) increment shall be compacted as needed to prevent settlement with tamping machine. Backfill material is to be brought to the optimum moisture content prior to starting compaction operations.

B. Contractor shall compact trench fill material as required to prevent settling of trenches. Contractor is to guarantee trenches against settling for a period of one year from the date of final acceptance by the Owner. Contractor is to fill, compact and seed settled trenches during this time at no additional cost to the Owner.

C. All pipe in the same trench shall have a minimum clearance of 4" from each other. Pipelines are not to be stacked vertically in the same trench. Pipes and wires or conduit are to have a minimum clearance of 12" from each other. Final fill over trenches shall be compacted to a level grade with no depressions.

3.4 ROAD, DRIVEWAY, PARKING LOT AND SIDEWALK PIPELINE CROSSINGS

A Any pipe, wire or communication cable that crosses any hardscaped surface six feet (6'-0") or wider, shall be installed in a PVC class 200 sleeve that is a minimum of two times larger than the pipe or wire bundle being sleeved. Sleeves are to have a minimum trench cover of 18" deep. Pipelines and wires that are to be installed below existing hardscaped improvements are to be installed in a sleeve as noted above, by horizontal directional boring. No cutting and patching of any hardscaped surface will be permitted without written permission of the Owner’s authorized representative. Newly paved areas are to be protected and preserved from construction damage. Jacking and hydraulic (water jet) driving are not permitted. The minimum sleeve size is two (2") inch. The Contractor is to verify the inside and outside diameters of pipes and wire bundles being sleeved to insure proper fit and installation. Irrigation pipelines and wires are to be installed in separate sleeves. No more than one (1) irrigation pipeline is allowed per pipe sleeve. Low voltage wires may be bundled with communication cable and installed in an appropriate size wire sleeve in conformance with NEC requirements for wires installed in conduit.

B. If approval to cut and patch a hardscaped surface has been obtained, the Contractor shall make cuts by a pavement / concrete saw or other approved means. Where any cutting or breaking of hardscaped surface work is necessary, it shall be removed and replaced by the Contractor conforming to all prevailing project specifications and requirements. Cuts are to be made along existing scoring lines or other markings to minimize negative visual aesthetics. Barriers and night lighting shall be erected to protect the public health welfare and safety. If approval to cut and patch a hardscaped surface is denied, the Contractor shall make the crossing by using horizontal directional boring. All materials and labor for all sleeves and crossings, whatever method, are to be supplied by the Contractor at no additional cost to the Owner.

C. Backfill shall be compacted to 95%. The Owner reserves the right to test such backfill. If the backfill does not meet the required 95% compaction, the Contractor shall recompact the trench. The Contractor shall pay for all additional testing until the work meets the specifications.

3.5 PIPING INSTALLATION

A. General: Support piping without strain on joints or fittings and allow for piping expansion and contraction. "Snake" pipe into trench in accordance with manufacturer's recommendations to allow for expansion. Lay on solid sub-base, uniformly sloped.

B. The Contractor shall examine all other portions of working drawing and plan trenching and pipe routing and depth so that no conflicts will arise between irrigation and any other work. Any corrective action will be the Contractor's responsibility at no further expense to the Owner. Contractor is to endeavor to route mainline pipes a minimum of fifteen feet (15’-0”) from trees and is to get permission to install mainline pipe closer in tight locations from the Owners Authorized Representative.

C. Joints:

1. PVC Solvent Weld: Pipe shall be cut square and reamed to full size. Check for assembly prior to solvent weld. Remove excess solvent. All assembly shall be in accordance with manufacturer's recommendations, including use of primer on 3/4" pipe or larger.

2. Steel or PVC Schedule 40 Threaded: Pipe shall be cut square and reamed to full size. Threads shall be full cut, true and tapered. Teflon tape suitable for conveyed fluid shall be applied to male thread only.

3. Open Ends: Open ends of piping shall be capped during progress to preclude foreign matter. All pipe shall be assembled free from dirt and pipe scale.

D. The Contractor shall thoroughly flush all mainline and lateral piping prior to the installation of irrigation heads. Flush entire piping system of all debris.

3.6 IRRIGATION HEAD INSTALLATION

A. Head spacing on drawings is diagrammatic. Head spacing and patterns shall be adjusted to provide complete and adequate coverage without overspray on non-planted areas. Flush all lines prior to installation of the sprinkler heads.

3.7 CONTROL WIRE

A. Low Voltage Control Wire: Protect wire by running along side mainline piping, maintain 4" separation to mainline. Bundle wires together and tape at intervals of ten (10') feet. Do not tape wire together when encased in sleeve. Minimum cover shall be 18 inches. Connect wires together at valve manifold with 3M DBY / DBR splice kits as required. Tag all control wire splices with approved control wire marker at splices in valve box and in controller.

3.8 CONTROL VALVE BOX MARKING

A. Imprint valve box lid by heat imprinting or engraving with appropriate controller and station number.

3.9 TESTING

A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Owner. Mainlines are to be center loaded with the joints exposed. Should any joints be covered before such tests, the Contractor shall, at their expense, uncover, test, and repair the work and that of other contractors to original conditions. Leaks and defects shown by tests shall be repaired and entire work re-tested. Tests may be made in sections, however, all connections between sections previously tested and new section must be included in the test.

B. Piping Upstream of control valves (Mainline): Maintain 100 PSI water pressure for a duration of four (4) hours. There shall be no drop in pressure during test except that due to ambient temperature changes. Perform test with control valves installed.

3.10 CONSTRUCTION OBSERVATION

A. Observation of Work:

1. Installation and operations must be approved by the Landscape Architect.

2. In no event shall the Contractor cover up or otherwise remove from view any work under this contract without prior approval of the Landscape Architect. Any work covered prior to inspection shall be opened to view by the Contractor at their expense.

B. Construction Observation: Periodic site visits shall be required for basic operations and installations during progression of the project. Such site visits will include, but not necessarily be limited to, the following items:

1. Preconstruction meeting.

2. Staking of plant and tree locations prior to irrigation installation.

3. Staking of sprinklers and mainline routing.

4. Mainline, wiring, lateral pipes & valve manifolds prior to backfill.

5. Irrigation coverage test and rough grading.

6. Trees & plants prior to installation, still in containers.

7. Fine grading of turf areas prior to hydroseeding.

8. Substantial completion to start maintenance.

9. Final acceptance after successful maintenance period.

The Owner will pay for initial construction observation visits, however, any additional visits required due to non-compliance, incomplete work, or substandard performance will be paid by the contractor at a cost of $750.00 per extra visit.

C. Coverage Test: When the irrigation system is completed, the Contractor in the presence of the Landscape Architect shall perform a coverage test of water afforded in the planting areas. The Contractor shall furnish all materials and labor required to correct any inadequacies of coverage disclosed. The Contractor shall inform the Landscape Architect of any deviation from the plan required due to wind, planting, soil, or site conditions that bear on proper coverage. If such corrections or additions are required in the irrigation system, the Contractor shall make all adjustments and corrections without any extra cost to the Owner.

D. Completion of Work: Prior to substantial completion and the start of the maintenance period, the Contractor shall deliver to the Owner a complete set of as built drawings on 24 lbs bright white bond paper, two (2) sets of manuals covering all materials in the irrigation system with a list of local vendors, two (2) sets of all tools required to maintain system in tool boxes, two (2) hand held remote radio kit, three (3) quick coupler keys with hose swivels and three (3) quick coupler cover keys, two (2) gate valve operating handles, waterproof color coded controller

diagrams and extra equipment listed below not installed as part of the project. Irrigation system shall be fully automatic, operable and provide full coverage of the planting areas. In judging the work, no allowance for deviation from the original plans and specifications will be made unless already approved in writing at proper time. Should it become necessary, due to developed conditions, to occupy any portion of the work before the Contract is fully completed, such occupancy shall not constitute acceptance. The Contractor will not be responsible for any damage caused by the Owner's work forces.

3.11 EXTRA IRRIGATION EQUIPMENT

A. The Contractor shall supply the following extra equipment to be installed at the direction of the Landscape Architect during the project. Each item is to include all piping, wiring, fittings, appurtenances, labor and equipment costs for a complete installation at no additional cost to the Owner. Should any items not be installed as part of the project, the remaining items are to be delivered to Owner as part of project completion documentation.

1. Five (5): Each kind of sprinkler on the irrigation legend.
2. One (1): Each kind and size of remote control valve on the irrigation legend.

All work is to be in compliance with all project specifications and construction details at no additional cost to the Owner. Items not installed as part of the project are to be delivered to the Owner as part of project close out procedures (turn over items).

3.12 MAINTENANCE

A. Adjustments: Irrigation system shall be maintained and adjusted as required to provide proper coverage throughout the 120 day maintenance period. Irrigation system maintenance shall commence upon approval of substantial completion following irrigation installation, planting operations, and general site clean up. Maintenance shall be continued until final acceptance.

B. Irrigation controller shall be set during this time with Owner. Training for persons appointed by the Owner is to be completed during this time. Final acceptance of the project will NOT occur until all training of Owner’s personnel is completed.

-- END OF SECTION --

SECTION 329000
LANDSCAPE CONSTRUCTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all material, labor, equipment and services necessary to do all Landscape Construction work and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded. Work is to include, but is not limited to, the following:

1. Soil Testing
2. Clearing, Ripping and Grading
3. Cultivation, Soil Amending and Leaching
4. Furnish and Plant Plants and Trees
5. Fertilization
6. Turfgrass Sod Installation / Hydroseed / Renovation
7. Weeding
8. Staking
9. Clean-up and Maintenance

1.2 RELATED SPECIFICATION SECTIONS

Division 31	EARTHWORK
32 8400	LANDSCAPE IRRIGATION
Division 03	CONCRETE
Division 26	ELECTRICAL

1.3 STANDARDS

A. Materials and installation shall conform with all State and Local codes and regulations governing the trades included in this work. Requirements of these plans and specifications not conforming therewith, but exceeding code requirements, then the plans and specifications shall govern.

1.4 DEFINITIONS

A. The term approved shall mean by the Architect, and only in writing.

1.5 EXAMINATION OF SPECIFICATIONS, PLANS AND SITE

A. It shall be the responsibility of the Contractor to carefully examine the site, plans and specifications relating to this work for completeness, accuracy and clarity. Any conflict, error, or clarification shall be immediately brought to the attention of the Owner’s authorized representative in writing to obtain a ruling. Failure to do so prior to bidding shall result in any corrective work necessary shall be completed at the Contractor’s expense.

1.6 PERMITS AND INSPECTIONS

A. The Contractor shall obtain and pay required fees to any governmental or public agency. Permits

for the installation or construction or the work included under this Contract, which are required by legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. Contractor shall also arrange for and pay costs in connection with inspections and examination required by these authorities.

1.7 GUARANTEE

A. Guarantee shrubs, ground covers, and lawn as to growth and health for one (1) year after final acceptance by Owner. The contractor is responsible for replacement of plant materials due to theft and vandalism until final acceptance of the project by the Owner after completion of the specified maintenance period.

B. Guarantee trees to live and grow upright for a period of one (1) year after completion and final acceptance by the Owner. The contractor is responsible for replacement of trees due to theft and vandalism until final acceptance of the project by the Owner after completion of the specified maintenance period.

C. Replace plants which lose more than 30% of their original leaves within the below described time limits.

D. Remove and replace plants within 15 days of notification which fail to conform. Replace with materials as originally specified. Guarantee for replaced materials shall begin with date of replanting and shall be as previously described.

1.8 SUBMITTALS

A. Within the required time period stated, the Contractor shall submit six (6) copies of complete lists of proposed materials to Landscape Architect including source, manufacturers name and catalog numbers.

B. Materials and equipment shall not be ordered until given written approval by Landscape Architect.

C. The Contractor shall confirm availability of plant material, supplies and materials for inclusion in the submittal. If a plant is found not to be suitable or available, the Contractor is to submit a list of three to five appropriate substitutions that are available for selection by the Landscape Architect.

1.9 UNDERGROUND OBSTRUCTION

A. The Contractor shall verify all underground obstructions and / or utilities, existing or proposed prior to making landscape excavations or installing tree stakes. Contractor shall avail themselves of any as built drawings of the site, Underground Service Alert (USA) 1-800-227-2600 and records of existing and proposed site work.

B. If there is a conflict with the utilities and the planting, notify the Landscape Architect for a ruling prior to planting.

1.10 PROJECT CONDITIONS

A. No plants shall be planted in situations that show obvious poor drainage. Such situations shall be brought to the attention of the Landscape Architect and Owner’s authorized representative. Generally, the drainage problem is to be corrected prior to installing plant material.

B. All landscape areas are to be deep ripped to a depth of twelve inches (12”) below finish grade in two directions. All trees are to have 18" diameter drainage holes that are 10’ deep.

C. The Contractor shall guarantee repair of damage to any part of the premises resulting from leaks, defects in materials, equipment or workmanship. The Contractor shall be liable for any and all accidents resulting from their work, including open holes and trenches during construction.

D. During landscape construction operations keep hardscaped surfaces clean and work areas organized.

E. Landscape concrete mow strips are to be installed so that they do not conflict with site drainage or impede drainage away from buildings. Generally, a minimum 2% slope away from buildings is to be maintained for positive site drainage. Concrete mow strips are not to trap water or cause puddling.

1.11 WORKMANSHIP

A. The Contractor shall have experience and demonstrated ability in the installation of landscapes of this type. No work shall be completed without supervision by a qualified foreman. All work shall be installed by skilled persons proficient in the trades required, in a neat, orderly and organized manner, with the recognized standards of craftsmanship developed for the industry and as described in the plans, specifications and manufacturers installation instructions.

1.12 SOIL TESTING

A. An independent soil testing laboratory is to test the existing soil after rough grading operations are completed with a complete fertility assay to evaluate the soils ability to maintain and support the ornamental landscaping. Samples from three (3) locations on the site are to be taken, with two samples from each location, one at four (4") inches in depth, and the second at sixteen (16") inches in depth (six samples). The soil testing laboratory is also to complete a preliminary screening for detrimental agricultural chemical residue that may be present on site, if these results are positive, notify the Owners authorized representative for a ruling. The contractor is to pay for all required soil tests and consulting time with the soil scientist for detailed recommendations to be submitted to the Owners authorized representative for evaluation.

B. After the soil amending and leaching process, if required, has been completed, the Contractor is to take additional samples from the three (3) locations on the site, with two samples from each location, one at four (4”) inches in depth, and the second at sixteen (16”) inches in depth (six samples) to evaluate the progress and effectiveness of the soil amending and leaching work. The contractor is to pay for all required soil tests and consulting time with the soil scientist for detailed recommendations to be submitted to the Owners authorized representative for evaluation.

1.13 CONSTRUCTION OBSERVATION

A. The Contractor is to coordinate construction observation site visits with the Landscape Architect during the appropriate phases of construction, or as required by the Landscape Architect. The Contractor is to schedule site visits a minimum of one week in advance at the required phases of construction. The following outlines the phases of construction which require a site visit, however it is not limited to the following construction phases:

1. Preconstruction meeting

2. Staking of plant and tree locations prior to irrigation installation.

3. Staking of sprinklers and mainline routing.

4. Mainlines, wiring, lateral pipes, & valve manifolds prior to backfill.

5. Irrigation coverage test and rough grading.

6. Trees & plants prior to installation, still in containers.

7. Fine grading of turf areas prior to sod and hydroseed installation.

8. Substantial completion to start maintenance.

9. Final acceptance after successful maintenance period.

The Owner will pay for initial construction observation visits, however, any additional visits required due to non-compliance, incomplete work, or substandard performance will be paid by the contractor at a cost of $750.00 per extra visit.

1.14 PROTECTION TO THE PUBLIC HEALTH AND WELFARE

A. The Contractor in the course of their work shall make every effort to guard the public health, safety and welfare during construction. This shall include erection of barricades, night warning lights and all necessary devices required to protect the public health and welfare or as required by existing governmental codes. The Contractor shall accept any and all liabilities arising from accident or injury on the job and after construction. All equipment which protrudes above grade shall be installed against a structure or an appropriate barricade shall be erected to protect public safety.

PART 2 - MATERIALS

2.1 PLANTS

A. Conform to list of plant materials on drawings. Contractor is to provide digital photos of representative example of each plant and tree type to be used and submit to Landscape Architect for review and comment. Plants and trees are also to be inspected when delivered to the site so non-conforming materials can be identified prior to planting.

B. Plants shall be the best of their kind and class, and of optimum age, and in conformance with the standards of the American Society of Nurserymen.

C. Plants shall have normal, well-developed branch systems and shall not be root or pot-bound. Do not prune or top trees prior to delivery.

D. Delivery to be made not more than 2 days prior to installation unless nursery area approved by landscape architect is established.

E. It will be the responsibility of the contractor to place material order(s) sufficiently in advance of planting to assure availability of plants in species and size specified. Substitutions for plants and trees will not be made due to lack of advance planning.

F. No substitutions will be made without approval of the Landscape Architect or authorized representative.

2.2 SOIL AMENDMENTS

A. Soil amendments (type and quantity) are to be based on the soil test results and recommendations by the soil testing laboratory. The contractor is to include the amendments outlined in part 3.03 of

this Section in the bid price. Prices for the soil amendments are to be quoted as unit prices to be adjusted based upon the recommendation of the testing lab. The contractor is to pay for all required soil tests and consulting time with the soil scientist for detailed recommendations.

B. Nitrified Aged Fir Bark Humus (forest product) as supplied by Superior Soil Supplements, Hanford, California, (559) 904-3372.

C. Commercial fertilizer (15-15-15), Best Pre-plant fertilizer (6-24-24 XB), slow release fertilizer Best All Season (19-6-12) with Polyon 43.

D. Gypsum (100% purity) and Elemental Soil Sulfur (100% purity) as supplied by Superior Soil Supplements, Hanford, California, (559) 904-3372.

E. Plant fertilizer tabs: Agriform, Best-Tabs or approved equal, quantities as shown below: 1 gallon plant (2 tabs), 5 gallon plant (4 tabs), 15 gallon plant (6 tabs) & box size tree (8 tabs).

F. Global Premium Humate as supplied by Superior Soil Supplements, Hanford, California, (559) 904-3372.

G. Certificates: In addition to any certificates specified, the Contractor shall furnish a certificate with each delivery of bulk material stating the source, quantity, date, and type of material. All certificates shall be delivered to the Owners authorized representative at the time of each delivery.

H. Samples: The contractor is to submit samples of the materials to be used for inspection and approval.

2.3 ACCESSORIES

A. Tree Stakes: 2 inches by 2 inches by 10 feet long treated lodgepole or natural redwood. Use two stakes per tree. See the tree installation detail.

B. Tree Ties: flexible vinyl "Cinch-Tie", manufactured by V.I.T. Products, San Diego, California, (619) 673-1760, and distributed by Horizon Sales, Pleasanton, California, (510) 462-6602. Use a minimum of four 24" ties per tree. See the tree installation detail.

C. Tree String Trimmer Guard: polyethylene "Trim Guard", manufactured by V.I.T. Products, San Diego, California, (619) 673-1760, and distributed by Horizon Sales, Pleasanton, California, (510) 462-6602. Use one Trim Guard per tree in the lawn areas only.

D. Tree Root Barriers: All trees within ten (10'-0") feet of a hardscaped surface, perimeter fence or building are to have root barriers installed that are 24" deep by 24" wide as manufactured by Root Solutions, Inc. and distributed by Vespro Inc., San Rafael, California, (415) 434-3072. Root barriers are to be installed so each fifteen gallon tree is to have up to 20 panels and box size trees are to have additional panels as required. If the concrete is only on one side of the tree, then 10 panels (centered on the tree) are to be installed in a straight line along the concrete or boundary as recommended by the manufacturer, or if the concrete is on two sides of the tree, then install 10 panels (centered on the tree) on two sides or 20 panels are to be installed around the perimeter of the concrete. Tree root barriers are NOT to be installed in a circular pattern around the tree, if concrete is on more than two sides of the tree add panels as required.

E. Top Soil: If required, imported topsoil shall be natural, fertile, friable loam, capable of sustaining vigorous plant growth, free of subsoil, roots, grass, excessive amount of weeds, salt, stone and foreign matter; acidity range of pH 5.5 to 7.5; containing a minimum of 4% and a maximum of 25% organic matter. Obtain approval of the Landscape Architect or Authorized representative for

placement. The contractor is to submit a topsoil sample to an approved testing lab for a complete fertility assay for approval prior to importing the material on-site.

F. Import Soil: If required, imported fill dirt shall be tested with a fertility assay from Dellavalle Laboratories to certify that the fill dirt is free of salt, boron or other deleterious minerals or matter prior to delivery and placement on the site. Contractor is responsible for all remediation required for the placement of substandard fill dirt containing salt, boron or other deleterious minerals or matter that may require the installation of additional soil amendments, leaching, additional soil testing, replacement of failed plant materials to bring the non-conforming soil into compliance at the Contractors sole expense.

G. Other Materials: Materials not specifically indicated, but necessary for the proper execution of the work, shall be of first quality as selected by the Contractor subject to approval of the Landscape Architect.

2.4 WEED CONTROL

A. Methods and chemicals shall be suitable with regard to season and shall control weeds and shall be approved by all governing agencies.

B. Treatment shall not damage or impede growth of trees, shrubs, and ground covers to be planted, nor kill or damage any existing plant material specified to remain.

C. Applicator shall be a licensed State of California Agricultural Pest Control Operator, Category E, or as required by all governing agencies.

D. Contractor shall obtain required permits from County Agricultural Commissioner. Weed control treatment shall be in accordance with Federal, State of California, County and local codes and regulations, and shall be safe, not cause a health hazard, nor disrupt or inconvenience continuing business operations of the Owner and neighbors, public street, parking lot and sidewalk use or construction activities.

E. Method of treatment shall be strictly in accordance with manufacturer's recommendations.

F. Method of application and chemicals to be reviewed and approved by the Owners representative.

G. Contractor shall ascertain and insure that all planted areas are weed-free prior to planting and maintain the site weed free during construction and maintenance periods.

2.5 STABILIZED DECOMPOSED GRANITE

A. Gold decomposed granite is to be supplied by Rosenbalm Rockery, or approved equal and is to meet gradation specification as determined by ASTM C 136 methodology (Caltrans 202) with sand equivalent as determined by ASTM D 2419 methodology (Caltrans 217) and shall have a minimum of 30.

B. Naturalseal is a stabilizing organic non-toxic binder, buff in color and without a marked odor. The swell volume shall have a minimum of 35 ml/g with a minimum mucilliod content of 80 percent. The light extraneious matter shall not exceed a maximum of 20 percent with the heavy extraneous matter not exceeding 5 percent. The material shall be screened with 90 – 100 percent passing a 200 mesh sieve.

C. Decomposed granite is derived from the crushing and screening of naturally friable granite. The blending of course sand with rock dust is not an equal product. The granite is screened to include

stone particles of 3/8” minus. The particles that pass the 200 screen mesh as determined by ASTM methodology shall not exceed 18 percent. The sand equivalent shall be a minimum of 30 and the R-value shall be a minimum of 70.

D. Stabilizing organic binder Naturalseal as distributed by Rosenbalm Rockery Inc. shall have a minimum swell volume of 32 ml/gm. The binder shall be incorporated with the granite fines by the use of a pug mill that includes a weight belt feeder that insures the proper ratio of binder to granite fines. Blending with the use of a bucket loader or similar is not acceptable. For pathways the binder shall be blended at the rate of 12 lbs per ton of granite fines. For parking lots or roadways the binder shall be incorporated at the rate of 14 lbs per ton.

E. For pathways, stabilized decomposed granite shall be placed to a minimum depth of 3” compacted thickness. For driveways or vehicular roadways stabilized decomposed granite shall be placed to a minimum depth of 4” compacted thickness.

F. For each 2” lift evenly spread the material over designated area. Grade and smooth as outlined on the plans. Thoroughly water entire area so that the entire depth of the material is moist. After a period of +/- 6 hours compact the final lift with a 1,000 – 3,000 lbs static drum roller. Allow for a sufficient curing period of +/- 4 days prior to use.

PART 3 - EXECUTION

3.1 SITE INSPECTION

A. Locate cables, conduit, piping, and other obstacles prior to beginning excavation. Notify Owners representative of obstacles requiring relocation.

B. Remove rocks and other similar underground obstructions to depths necessary to permit proper installation of lawns and planting.

C. Verify that landscape irrigation system has been properly installed and is fully operational.

D. Verify dimensions shown on plan and notify Owners representative of any discrepancy.

E. Review plant list and consult Owners representative with any questions or concerns.

3.2 GRADING

A. Contractor is to remove weeds and debris from site prior to starting grading operations and is to maintain the site weed free throughout the progress of construction.

B. Contractor is to work soil in a manner which does not cause excessive compaction or clods which will not break easily. Apply water as necessary to obtain optimum moisture content for tilling and planting. The Contractor is to coordinate deep ripping of all landscape areas to a depth of twelve inches (12") to break up compacted areas to improve drainage.

C. After the grades have been reestablished after irrigation trench backfill and prior to planting, the Contractor is to heavily irrigate the site to the point of producing runoff to verify that the site is free draining without puddles or low spots. Contractor is to address grading problems and repeat the test until all puddles and areas of standing water drain within one half hour (1/2 hr). Contractor is to fill settled areas as required. Planting shall not proceed until all grading corrections have been completed and the areas have been retested to confirm conformance.

D. The contractor is responsible for the grading of all planting areas. The grades shall be gently

flowing with no abrupt changes. The contractor is responsible to insure that the planting areas have adequate soil and is to fill low areas as needed. The contractor is to grade the areas to drain as intended by the site grading plan by the Project Civil Engineer. Typically the planter areas are to be slightly crowned or cross sloped to insure positive drainage away from planted areas to the perimeter to drain as intended by the Site Drainage Plan. No standing water will be permitted in planter areas where plants and trees are located. Slope surfaces away from buildings at a 2% slope with no pockets of standing water. The contractor is responsible for all import or export of soil and removal of debris, trash, or other elements off site at Contractors expense to provide the Owner with a completed landscape project at no additional cost to the Owner.

E. Provide neat, smooth, and uniform finish grade. Final soil elevations in perimeter areas are to be as noted below. Grades may taper from perimeter areas over a smooth gradual transition.

1. Turf Areas: 1” below the adjacent sidewalks or other hardscape features.
2. Planter Areas: 2” below the adjacent sidewalks or other hardscape features.

F. Notify Owners representative upon completion of grading for approval and to verify the smoothness and accuracy of fine grading and clod-free condition of planting surface. No planting is to be started prior to obtaining the approval of the fine grading from the Owners authorized representative.

G. Install concrete mow strips between all turf and planter boundaries. Install the mow strips as shown in the Concrete Mow Strip Detail and as outlined in the project plans and specifications. Contractor is to insure that concrete mow strips do not interfere with site drainage and do not trap water or cause puddling.

3.3 SOIL PREPARATION

A. Soil Amendments, Cultivation and Weed Control:

1. The contractor is to cultivate the soil amendments into the top eight (8") inches of soil. The following soil amendment types and quantities are to be included in the bid. Pending the results of the soil tests, and recommendations of the soil testing laboratory, adjustments to the types and quantities of soil amendments to be used may be necessary. The contract price will be adjusted according to the actual soil amendments installed on the project. The contractor is to include the following soil amendments as part of the bid:

   a. Lawn Areas:
      1) Gypsum (100% purity) (Preplant), (2 tons per acre).
      2) Soil Sulfur (100% purity) (Preplant), (1/2 ton per acre).
      3) Best Triple Pro Fertilizer (Preplant) - (15-15-15), (500 lbs per acre).
      4) Best Preplant Fertilizer (Preplant) - (6-24-24 XB), (500 lbs per acre).
      5) Global Premium Humate (Preplant), (250 lbs per acre).
      6) Best All Season Fertilizer with Polyon 43 (Maintenance) - (19-6-12), maintenance applications and rates as follows:

         Hydroseeded Turf Areas: (130 lbs per acre) per maintenance application. Minimum of seven maintenance applications required for bid. Fertilize hydroseeded areas every other week. Actual application will conform to soil test results.

         Sodded Turf Areas: (200 lbs per acre) per maintenance application. Minimum of four maintenance applications required for bid. Fertilize sod areas monthly. Actual application will conform to soil test results.

7) Pelletized Gypsum, (Maintenance) - (1 tons per acre). One maintenance application required for bid. Actual application will conform to soil test results.

8) Global Premium Humate, (Maintenance) - (250 lbs per acre). One maintenance application required for bid. Actual application will conform to soil test results.

b. Planter Areas:
1) Nitrified Aged Fir Humus (forest product) (Preplant), (4 cu. yds. per 1000 sq. ft.).
2) Gypsum (100% purity) (Preplant), (2 tons per acre).
3) Soil Sulfur (100% purity) (Preplant), (1/2 ton per acre).
4) Best Triple Pro Fertilizer (Preplant), (15-15-15), 500 lbs per acre.
5) Best Preplant Fertilizer (Preplant), (6-24-24 XB), (500 lbs per acre).
6) Global Premium Humate (Preplant), (250 lbs per acre).
7) Best All Season Fertilizer with Polyon 43 (Maintenance) - (19-6-12), maintenance applications and rates as follows:

Planter Areas: (200 lbs per acre) per maintenance application. Minimum of four maintenance applications required for bid. Fertilize planter areas monthly. Actual application will conform to soil test results.

8) Pelletized Gypsum, (Maintenance) - (1 tons per acre). One maintenance application required for bid. Actual application will conform with soil test results.

9) Global Premium Humate, (Maintenance) - (250 lbs per acre). One maintenance application required for bid. Actual application will conform to soil test results.

The Owners authorized representative and Contractor shall negotiate the differences in costs according to the materials required based upon the recommendations of the soil testing laboratory. No labor difference in cost will be allowed for application of the corrected materials to be used.

2. Soil Amending – Application #1: If salt is present in the soil test results, Contractor is to apply and incorporate the following soil amendments into the soil – Gypsum, Soil Sulfur and Nitrified Aged Fir Humus (planter areas only). Contractor is to reestablish site grades (smooth areas without displacing amendments) and leach the soils for four to six weeks.

3. Contractor is to retest the site soils as noted in 1.12 (B) above, if salt is present in the soil test results and leaching is required.

4. Soil Amending – Application #2: Contractor is to apply and incorporate the following soil amendments into the soil – Preplant Fertilizers and Humate amendments. Contractor is to reestablish site grades (smooth areas without displacing amendments) and leach the soils for one to two weeks.

5. If there are no or low salts in the soil test reports and leaching is not required, then the Contractor can combine Preplant Soil Amendment Applications #1 & #2 and delete the leaching requirement and issue a credit to the District.

6. After cultivation, water the site until the first weed crop is established. Cultivate or treat with chemicals to assure a weed-free condition.

7. Planting beds may be established after the second cultivation and final fine grading has been inspected and approved.

B. Planting holes:

1. All 15 gallon size trees or larger, are to have one 18” diameter hole drilled up to ten (10’) deep to insure proper drainage. Holes are to be off set with tree root balls “benched” into the top of the hole to prevent the tree against settlement.

2. Holes are to be excavated three times the size of the rootball. The contractor is to slightly off-set the drainage holes to prevent settling of plants after installation. The contractor is to guarantee that the trees and shrubs will not settle below grade. Trees in turf grass areas are to be planted after the hydroseed and sod has become established and no longer requires excessive irrigation, which may cause undue stress to the trees.

3. Holes are to be in damp (but not saturated) and friable condition with all hidden obstructions removed before planting. The backfill is to be mixed thoroughly as specified adjacent to the planting hole prior to planting.

C. Leaching: Leaching of the soils is a critical element in how fast the soils will be reclaimed. The Contractor is to expedite the irrigation installation during the early stages of the project to allow leaching operations with the irrigation system at the earliest possible time in the project schedule. The Contractor is to provide labor and materials as needed to leach soils with irrigation water in areas that will not delay the progress of other site improvements. During leaching operations, the Contractor is to maintain the soil saturated while limiting runoff. Contractor is to monitor depth of soil saturation to plan periods of drying appropriately.

Contractor is responsible for temporary measures required to retrofit the planter area irrigation system for leaching by installing spray nozzles on bubbler pop ups, installing temporary sprinklers, relocating sprinkler or other improvements required to insure good coverage of all planter areas for the purposes of leaching. Once leaching has been completed, contractor is to remove temporary improvements and restore the system to conform to the project documents.

3.4 PLANTING

A. Water plants immediately upon delivery to site. Maintain in moist condition until planted.

B. Space plants uniformly as shown on plans. The Contractor is to stake the locations of plants and tree locations prior to layout of irrigation system for review and approval by the Landscape Architect in the field prior to trenching. Contractor is to use color coded flags to stake plant materials by variety. After the plant layout has been approved, the Contractor is to stake the bubbler locations for each plant and tree. Bubblers are to be located on the uphill side of the plant within the plant basin. Landscape Architect may move, add or delete plants or trees in the field and the Contractor is to adjust the work as required at no additional cost to the District. Contractor is not to proceed with irrigation or planting operations, until the planting locations have been approved by the Landscape Architect in the field.

C. Cut cans by cutting vertically on two opposite sides of can with can cutter, or as recommended by the nursery for the type and size of containers supplied with the plant materials. Do not damage plant.

D. Plant immediately after removal from the can or flat. Position the top of the plant root ball 1" above finish grade. Backfill as follows:

1. (85%) native soil.

2. (15%) nitrified humus.

3. Azaleas and camellias are to have an additional 2 cu. ft. Camellia Mix in backfill.

4. Agriform / Best plant tabs as indicated on plans. Place plant tabs beside root ball as recommended by the fertilizer manufacturer. Construct a watering well one foot radius from stem or trunk that will allow water to fill well at least 3" deep for shrubs and two foot radius from trunk that will allow water to fill well at least 4" deep for trees. Fill water well at least six times by hand after planting.

E. Fertilize all ground cover areas with post-plant commercial slow release fertilizer 19-6-12 upon completion of planting, and every 30 days through the first growing season at a rate of 5 lbs per 1000 square feet, or as recommended by the soil test results.

F. At completion of planting, all non-turf planted areas are to receive a three inch (3") layer of topdressing mulch of shredded Supreme walk-on bark as supplied by Superior Soil Suppliments, contact Andrea Fike (559) 904-3372. Wash excess bark off leaves and do not engulf stems of plants and ground cover.

G. Turf Hydroseed and Renovation:

1. The turf areas, as indicated on the plans, shall be hydroseeded in one operation after all trees, weed removal, soil preparation, grading, scalping, verticutting and irrigation system work have been completely installed, inspected and approved.

2. Hydromulch mixing shall be performed in a tank with a built-in continuous agitation and recirculation system of sufficient capacity to produce a homogeneous slurry of fiber, fertilizer, water, and additives in the specified proportion. Hydroseeding Slurry Mix:

   a. Mulch: Agrono-Mulch @ 1500 lbs per acre. As distributed by Agrono-Tec Seed Co., Fresno, California, (559) 277-2444.
   b. Binder: Agrono-Tac @ 120 lbs per acre.
      Fiber Plus @ 25 lbs per acre.
   c. Fertilizer: Soluble time release granular mixture of 24-4-8 @ 250 lbs per acre.
   d. Seed – Bermudagrass Turf: Pan Am Bermudagrass (4 lbs per 1,000 sq ft) and Perennial Ryegrass (8 lbs per 1,000 sq ft) Blend. Seed at a rate of 12.0 lbs per 1,000 sq ft.

3. The final seed mix is subject to change. Verify the final approved seed mixes with the Owners authorized representative prior to seeding. The seed mix will be adjusted to account for the use, drought tolerance, and the time of year to be installed.

4. The area to be seeded shall be slightly moist after the last watering and final weeding operations. The grading must be approved prior to hydroseeding. The site must be free draining prior to hydroseeding.

5. The area to be seeded shall be hydromulched with a discharge system that will apply the slurry to the areas to be treated at a continuous, uniform rate. The tank shall have a minimum capacity of 1000 gallons. Nozzle applying the slurry shall be held close enough to

the areas to be planted to distribute the slurry in a uniform coating on the surface. A green marker dye shall be used to show such coverage.

6. The turf area establishment work is to proceed as follows. Time periods noted are from the date of hydroseed planting.

   a. *Weeks 1 thru 4:* Fertilize once (week 3 or week 4) with Best 19-6-12 with polyon 43 at a rate of 3.0 lbs per 1,000 sq ft (130 lbs per acre) to keep hydroseed in a healthy growth state and mow once (week 4) with reel mower with roller (Toro 5210, or approved equal) to stimulate the lateral turf growth and increase density.
   b. *Weeks 5 thru 14:* Fertilize every other week (weeks 6, 8, 10, 12 & 14) with Best 19-6-12 with polyon 43 at a rate of 3.0 lbs per 1,000 sq ft (130 lbs per acre). Mow 2 times weekly with reel mower with roller (Toro 5210, or approved equal) to stimulate the lateral turf growth and increase density. Mowing height to be 5/8" to 3/4" of an inch.
   c. *Weeks 15 thru 16:* Fertilize as required to keep turfgrass in a healthy condition. Mow 1-2 times weekly with reel mower with roller (Toro 5210, or approved equal) and raise turfgrass mowing height to 1" to complete the maintenance period.

7. A minimum of one trained workman shall be on the site 2 hrs per day (minimum or as required) after hydroseeding and through the maintenance period. The hydroseeded areas shall be watered immediately and kept damp during the entire germination period. Areas that are drying out too soon due to wind or other causes shall be watered by hand until the whole grass area comes up in a uniform and even covering of grass. Care shall be used to not overwater, which would create erosion. All erosion scars are to be repaired the same day.

8. The contractor is to carefully observe the newly planted grass to keep moist and in a healthy growing condition. The contractor is to water and fertilize as needed to keep the turf in a vigorous healthy condition.

9. The contractor is to protect the newly seeded area from foot traffic as needed. The contractor is to continuously reseed and repair damaged areas. The turf areas, as indicated on the plans, shall be hydroseeded in one operation after all weed removal, soil preparation, grading and irrigation system have been completely installed and approved. Trees are to be installed after the turf has been established. Stake tree locations during turf establishment.

H. Lawn Installation (Sod):

1. The turf areas, as indicated on the plans, shall be sodded (big rolls where possible) in one operation after all weed removal, soil preparation, grading and irrigation system have been completely installed and approved. Trees are to be installed after the turf has been established. Stake tree locations during turf establishment.

2. The allowable planting window for sod starts on May 1st and extends thru August 30th annually. Planting after August 30th or before May 1st requires specified sod that is overseeded with perennial ryegrass at no additional cost to the project. Do not plant in excessively hot weather or when unseasonably hot weather is forecast in the near future.

3. Finish grade is to be smooth and firm to prevent differential settlement. Big roll sod is to be laid in staggered rows (brick like pattern). Edges are to be firmly butted together to insure soil to soil contact between sod pieces. Sodded areas are to be rolled (water roller) to remove air pockets and insure good soil contact.

4. The area to be sodded shall be slightly moist after the last watering and final weeding operations. The grading must be approved prior to sodding. The site must be free draining prior to sodding.

5. The turf area establishment work is to proceed as follows. Time periods noted are from the date of sod planting.

   a. *Weeks 1 thru 4:* Fertilize once (week 2 or week 3) with Best 19-6-12 with polyon 43 at a rate of 4.6 lbs per 1,000 sq ft (200 lbs per acre) to keep sod in a healthy growth state and mow once per week.
   b. *Weeks 5 thru 10:* Fertilize twice (weeks 6 & 10) with Best 19-6-12 with polyon 43 at a rate of 4.6 lbs per 1,000 sq ft (200 lbs per acre). Mow 1 time weekly. Mowing height to be 3/4" to 1" inch.
   c. *Weeks 11 thru 12:* Fertilize once (week 11 or week 12) to keep turfgrass in a healthy condition. Mow 1 time weekly and raise turfgrass mowing height to 1" to complete the maintenance period.

6. A minimum of one trained workman shall be on the site 2 hrs per day after sodding and through the maintenance period. The sodded areas shall be watered immediately and kept damp during the entire establishment period. Areas that are drying out too soon due to wind or other causes shall be watered by hand until the whole grass area is established in a uniform manner. Care shall be used to not overwater, which would create erosion and fungus. All erosion scars are to be repaired the same day.

7. The contractor is to carefully observe the newly planted grass to keep moist and in a healthy growing condition. The contractor is to water and fertilize as needed to keep the turf in a vigorous healthy condition.

8. The contractor is to protect the newly sodded area from foot traffic as needed. The contractor is to continuously resod and repair damaged areas as required.

3.5 STAKING AND TYING

A. Remove nursery stakes and ties.

B. Install tree stakes 18" deep on windward and leeward sides of tree and tie to tree with 4 ties. Install ties loose enough to avoid injuring cambium layer of tree and to allow limited movement.

C. Remove nursery ties from shrubs and espaliered plants and install new plastic ties in a loose manner so new plant growth will not girdle the branch or stem.

3.6 MAINTENANCE

A. Maintain planted areas during the progress of the work and through the maintenance period. A minimum of one trained workman shall be on the site 4 hrs per day after planting until the fourth mowing and as needed through the maintenance period.

B. The maintenance period begins when the work is substantially completed and accepted by the Owner. The turf areas are to be completely planted and show active growth and reasonable coverage before the specified maintenance period can begin. The maintenance period shall be for one hundred twenty days (120) days, after substantial completion by the Owner. The Owner and Landscape Architect shall be notified a minimum of 10 days prior to the time that the work is ready for final inspection. This final inspection is required before the maintenance period can begin. The contractor is responsible to provide all materials and labor to maintain the site for the maintenance

period at no cost to the Owner. The maintenance period may be extended at no cost to the Owner should prevailing site conditions not warrant final acceptance by the Owner. The site should be in a weed free condition, the lawns should be established, vigorous, have minimum 99% coverage, be weed free, and fertilized, and all plants and trees are to be in good condition. The maintenance period will be extended in one month increments until the Contractor brings the site into compliance at no additional cost to the Owner.

C. During the maintenance period the contractor shall provide the following services, but is not limited to the services outlined below.

1. Maintain surfaces and supply additional top soil where necessary, including areas affected by erosion.

2. Water to ensure uniform seed growth and to keep surface of soil damp. Fertilize as specified on a monthly, or as needed basis.

3. Apply water slowly so that surface of soil will not puddle and crust.

4. Maintain turf & planted areas weed free. Hand weed or use chemicals at the Contractor's option.

5. Mow and maintain the turf areas, and pick up grass clippings to be hauled off site at the Contractors expense.

3.7 CLEAN-UP

A. Remove rubbish, trash, and debris resulting from the operation at the end of each working day.

B. Wash paved surfaces clean.

C. Maintenance period will begin with acceptance of installation by the Owner and will continue as noted in article 3.06.

3.8 EXTRA LANDSCAPE MATERIALS

A. Contractor shall supply the following extra materials to be installed at the direction of the Landscape Architect during the project at any time. Each item is to include all associated materials (landscape and irrigation) and all appurtenances associated with the item, including material, labor and equipment costs for a complete installation in accordance with the project documents at no additional cost to the Owner. Should any items not be installed as part of the project, the remaining items are to be delivered to Owner or a credit issued at the Owner’s option as part of the project completion documentation.

1. Five (5): One gallon size plants (Variety to be determined in the field)
2. Five (5): Five gallon size plants (Variety to be determined in the field)
3. Three (3): Fifteen gallon size trees (Variety to be determined in the field)

All work is to be in compliance with all project specifications and construction details at no additional cost to the Owner.

-- END OF SECTION --

SECTION 33 05 13

OUTLET STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Modular precast concrete manholes and structures with tongue-and-groove joints with masonry transition to cover frame, covers, anchorage, and accessories.
   2. Doghouse manhole connections to existing sanitary storm sewer lines.
   3. Bedding and cover materials.

B. Related Sections include but are not necessarily limited to:
   1. Section 03 21 00 – Concrete Reinforcement.
   2. Section 03 30 00 – Cast-In-Place Concrete.
   3. Section 31 23 00 – Earthwork.
   4. Section 31 23 16 – Trenching Backfilling and Compaction.
   5. Section 33 31 13 – Sanitary Sewer Pipe
   6. Section 33 41 13 – Storm Drain Piping.

C. Measurement and Payment:
   1. The contract lump sum price shall include full compensation for all costs and work involved with furnishing and installing manholes and structures.

1.2 REFERENCES

A. American Association of State Highway Transportation Officials (AASHTO):
   1. M288 – Geotextiles.
   2. M306 –Drainage Structure Castings.

B. American Concrete Institute (ACI):
   1. 530/530.1 – Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.

C. ASTM International (ASTM):
   1. C150 – Standard Specification for Portland Cement.
   2. D3350 – Standard Specification for Polyethylene Plastic Pipe and Fitting Materials.
   3. F2619 – Standard Specification for High-Density Polyethylene (HDPE) Line Pipe.

1.3 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for general submittal requirements and content.

B. Shop Drawings:
   1. Product technical data including:

a. Acknowledgement that products submitted meet requirements of standards referenced.
b. Manufacturer's installation instructions.

2. Fabrication and/or layout drawings:
   a. Include detailed diagrams of manholes showing typical components and dimensions, reinforcements and other details.
   b. Itemize, on separate schedule, sectional breakdown of each manhole structure with all components and refer to drawing identification number or notation.
   c. Indicate knockout elevations for all piping entering each manhole.

C. Product Data:
1. Submit manhole covers, component construction, features, configuration, and dimensions.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.5 DELIVERY, STORAGE AND HANDLING

A. See Section 01 65 00 – Delivery, Storage, and Handling for general requirements.

B. Comply with precast concrete manufacturer’s instructions and ASTM C913 for unloading, storing, and moving precast manholes and drainage structures.

C. Store precast concrete manholes and drainage structures to prevent damage to OWNER’s property or other public or private property. Repair property damaged from materials storage.

D. Mark each precast structure by indentation or water-proof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Manhole rings, covers and frames:
   a. Neenah Foundry Co.
   b. Deeter Foundry.
   c. Or approved equal.
2. Black mastic joint compound:
   a. Kalktite 340.
   b. Tufflex.
   c. Plastico.

3. Premolded joint compound:
    a. Ram Nec.
    b. Kent Seal.
    c. Or approved equal.
4. Flexible Seals:
    a. Kor-n-Seal
    b. Z-Lok-XP
    c. Or approved equal
5. Emulsified fibrated asphalt compound:
    a. Sonneborn Hydrocide 700B Semi-Mastic

2.2 MANHOLES AND STRUCTURES

A. Provide all outlet structures constructed with Portland ASTM C150, Type I or II cement with a tricalcium aluminate content not to exceed 8 percent.

B. Mortar and Grout: Type S, 3000-psi non-shrink grout as specified in Section 04 05 13 – Masonry Mortar and Grout.

2.3 FRAMES AND COVERS

A. Material: Cast iron per ASTM A48/A48M, Class 30B AASHTO M306.

B. Machined flat bearing surface, removable lockable boltable lid, size of grate shall match size of riser specified in plans, shall be removable to provide maintenance access, and shall be bolted in place or outfitted with approved tamper-resistant locking mechanism. maximum grate opening shall be 2".

C. Nominal Lid Grate Size: 24 inches.

2.4 COMPONENTS

A. Foundation Slab: Cast-in-place concrete of type specified in Section 03 30 00 – Cast-in-Place Concrete, leveled top surface for storm drain.

2.5 CONFIGURATION

A. Outlet structure: HDPE pipe, lipped male/female joints, rubber gasket or manufactured rope seal for all joints sleeved to receive pipe conduit and sections.

B. Shape: Rectangular.

C. Clear Inside Dimensions: 24-inch sides.

D. Design Depth: ft. as indicated on Drawings.

E. Clear Cover Opening: as indicated on Drawings.

F. Pipe Entry: Furnish openings as indicated on Drawings required.

G. Structure Joint Gaskets: ASTM C361; rubber.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify items provided by other sections of Work are properly sized and located.

C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.3 INSTALLATION - GENERAL

A. Excavation and Backfill:
   1. Excavate structures in location and to depth shown. Provide clearance around sidewalls of structure for construction operations, granular backfill.
   2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes or structures in dry trench.
   3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation.

B. Place outlet sections plumb and level, trim to correct elevations. Place foundation slab integral with bottom barrel section.

C. Make inverts with a semi-circular bottom conforming to the inside contour of the adjacent sewer sections. Where branches change direction in the manhole, make a circular curve in the manhole invert using as large a radius as manhole inside diameter will permit.

D. Set frames and covers level without tipping, to elevations shown on the drawings.

3.4 PRECAST CONCRETE OUTLET STRUCTIRE CONSTRUCTION

A. For all horizontal mating surfaces between concrete to concrete and concrete to metal, install resilient O-ring type gaskets.

B. For horizontal joints that fall below established high groundwater elevation shown, install a resilient O-ring type gasket or pre-molded joint compound.

C. For PVC pipe, install resilient O-ring gaskets centered in wall of manhole.

D. Seal all pipe penetrations in structure.
   1. Form pipe openings smooth and well shaped.
   2. After installation, seal cracks with, non-shrink grout.

E. Set and adjust frame and cover final 6-inch (minimum) to 18-inch (maximum) to match finished pavement or finished grade elevation using precast adjuster rings.

3.5 CAST-IN-PLACE CONCRETE OUTLET STRUCTURE INSTALLATION

A. Prepare crushed stone bedding or other support system shown on Drawings, to receive foundation slab as specified for precast manholes and structures.

B. Erect and brace forms against movement.

C. Install reinforcing steel as indicated on Drawings.

D. Place and cure concrete.

3.6 CASTINGS INSTALLATION

A. Set frames using mortar and masonry as indicated on Drawings. Set frame and cover 2-inches above finished grade where located within unpaved areas and grade away from cover beginning 1 inch below rim.

B. Vertical Adjustment of Existing Frames:
1. Where required, adjust top elevation of existing manholes and structures to finished grades shown on Drawings.
2. Carefully remove existing frames and remove mortar prior to reinstalling.
3. Reset existing frames, grates, and covers to required elevation as indicated on Drawings in accordance with requirements specified for installation of castings.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements; 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test concrete manhole and structure sections in accordance with ASTM C497.

END OF SECTION

SECTION 33 11 13

WATER UTILITY DISTRIBUTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pipe and fittings for public line including potable water line and fire water line.
2. Tapping Sleeves and Valves.
3. Valves and Fire Hydrants.
4. Underground pipe markers.
5. Bedding and cover materials.

B. Related Requirements:

1. Section 03 21 00 - Concrete Reinforcing.
2. Section 03 30 00 - Cast-In-Place Concrete: Concrete for thrust restraints.
3. Section 31 23 16 – Trenching backfill and compactor.
4. Section 33 13 00 - Disinfecting of Water Utility Distribution: Disinfection of water piping.

C. Measurement and Payment:

1. The contract lump sum price for Porterville College Allied Health Building shall include full compensation for all costs involved in constructing the water distribution system.

1.02 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:

1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

C. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
6. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
7. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
10. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
11. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

D. American Water Works Association:

1. AWWA C104 - ANSI Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm through 1,219 mm), for Water.
4. AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
7. AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
8. AWWA C200 - Steel Water Pipe 6 In. (150 mm) and Larger.
9. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
10. AWWA C206 - Field Welding of Steel Water Pipe.
11. AWWA C207 - Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm through 3,600 mm).
12. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings.
13. AWWA C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
14. AWWA C502 – Dry-Barrel Fire Hydrants.
15. AWWA C509 – Resilient Seated Gate Valves for Water Supply Service.
16. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
17. AWWA C605 - Water Treatment - Underground Installation of Polyvinyl Chloride PVC Pressure Pipe and Fittings for Water.

18. AWWA C606 - Grooved and Shouldered Joints.
19. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
20. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. through 12 In. (100 mm through 300 mm), for Water Distribution.
21. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.
22. AWWA M23 – PVC Pipe – Design and Installation.

E. Manufacturer’s Standardization Society of the Valve and Fittings Industry:

1. MSS SP-60 - Connecting Flange Joint between Tapping Sleeves and Tapping Valves.

F. National Fire Protection Agency:

1. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.

C. Shop Drawings: Indicate piping layout, including piping specialties.

D. Samples: Submit 10-feet of plastic ribbon tape trace wire.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.04 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

A. Valves: Mark valve body with manufacturer's name and pressure rating.

B. Perform Work in accordance with City of Fresno standard.

C. Maintain one copy of each document on site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 65 00 - Product Requirements: Requirements for delivery, storage, and handling for general requirements.

B. Deliver and store valves in shipping containers with labeling in place.

C. Block individual and stockpiled pipe lengths to prevent moving.

D. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

E. Store polyethylene materials out of sunlight.

1.07 EXISTING CONDITIONS

A. Verify field measurements prior to fabrication. Indicate field measurements on shop drawings.

PART 2 - PRODUCTS

2.01 WATER PIPING

A. Ductile Iron Pipe: AWWA C151. Bituminous outside coating: AWWA C151. Pipe Mortar Lining: AWWA C104, double thickness. Polyethylene Encasement: AWWA C105.

1. Pipe Class: AWWA C151, for nominal thickness, rated water working pressure and maximum depth of cover.
2. Fittings: Ductile iron, Compact fittings AWWA C153.

a. Coating and Lining:

1) Bituminous Coating: AWWA C110.
2) Cement Mortar Lining: AWWA C104, double thickness.

3. Joints:

a. Mechanical and Push-On Joints: AWWA C111.
b. Flanged Joints: AWWA C115.

B. Polyvinyl Chloride (PVC): AWWA C900 DR 18:

1. Fittings: AWWA C153, Ductile Iron.
2. Joints: PVC flexible elastomeric seals. Solvent-cement couplings are not permitted.

C. Polyvinyl Chloride (PVC): ASTM D1785 Schedule 40 (3” or less):

1. Fittings: PVC Schedule 80.
2. Joints: PVC flexible elastomeric seals or Solvent-cement couplings.

D. Steel Pipe: AWWA C200 Fabricated Pipe, minimum wall thickness Schedule 40.

1. Fittings and Special Sections: AWWA C208.
2. Flanges: AWWA C207 slip-on.
3. Field Welding Materials:

a. Pipe: AWWA C206.
b. Joints: AWWA C205.

4. Lined and Coated.

a. AWWA C213, fusion-bonded epoxy coating.

2.02 VALVES AND FIRE HYDRANTS

A. Valves: Conform to Section 40 05 50.

B. Fire Hydrants:

1. AWWA C502
2. 5 ¼ - inch valve opening.
3. 2-2 ½ and 1-5" nozzles.
4. AVK 2780, Mueller A-423 or equal.
5. Break off stem and coupling.
6. Leave weep hole open.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify existing utility water main size, location, and invert are as indicated on Drawings.

3.02 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Pre-Construction Site Photos:

1. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
2. Show mail boxes, curbing, lawns, driveways, signs, culverts, and other existing site features.

3. Include project description, date taken and sequential number on back of each photograph.

C. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Use only equipment specifically designed for pipe cutting. The use of chisels or hand saws will not be permitted. Grind edges smooth with beveled end for push-on connections.

D. Remove scale and dirt on inside and outside before assembly.

E. Prepare pipe connections to equipment with flanges or unions.

3.03 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 16 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.

B. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

C. Provide sheeting and shoring in accordance with Section 31 23 16.

3.04 INSTALLATION - PIPE

A. Install pipe in accordance with AWWA C600AWWA M 23 standards.

B. Handle and assemble pipe in accordance with manufacturer’s instructions and as indicated on Drawings.

C. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.

D. Maintain 10 ft horizontal separation of water main from sewer piping in accordance with State Water Works standards.

E. Install pipe to indicated elevation to within tolerance of 2- inches.

F. Install ductile iron piping and fittings to AWWA C600.

G. Weld pipe in accordance with AWWA C206. Weld joints in accordance with AWWA C205.

H. Flanged Joints: Not to be used in underground installations except within structures and as shown.

I. Route pipe in straight line. Relay pipe that is out of alignment or grade.

J. Install pipe with no high points. If unforeseen field conditions arise which necessitate high points, install air release valves as directed by Engineer.

K. Install pipe to have bearing along entire length of pipe. Excavate bell holes to permit proper joint installation. Do not lay pipe in wet or frozen trench.

L. Prevent foreign material from entering pipe during placement.

M. Install pipe to allow for expansion and contraction without stressing pipe or joints.

N. Close pipe openings with watertight plugs during work stoppages.

O. Install access fittings to permit disinfection of water system performed under Section 33 13 00.

P. Establish elevations of buried piping with not less than 3 ft of cover. Measure depth of cover from final surface grade to top of pipe barrel.

Q. Install plastic ribbon tape continuous over top of pipe. Per 40 05 13.

R. Install trace wire continuous over top of pipe coordinate with Section 40 05 13.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Install valves in accordance with Section 40 05 50.

B. Install hydrants in accordance with Section 40 05 50.

3.06 POLYETHYLENE ENCASEMENT

A. Encase ductile iron piping in polyethylene indicated on Drawings to prevent contact with surrounding backfill material.

B. Install in accordance with AWWA C105.

C. Terminate encasement 3 to 6 inches above ground where pipe is exposed.

3.07 THRUST RESTRAINT

A. Provide valves, tees, bends, caps, and plugs with concrete thrust blocks. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks at each elbow or change of pipe direction to resist resultant force and so pipe and fitting joints will be accessible for repair. Provide thrust restraint bearing on subsoil as shown on plans.

B. Install tie rods, clamps, set screw retainer glands, or restrained joints. Protect metal restrained joint components against corrosion by applying a bituminous coating, or by concrete mortar encasement of metal area. Do not encase pipe and fitting joints to flanges.

C. Install thrust blocks, tie rods, and joint restraint at dead ends of water main.

3.08 BACKFILLING

A. Backfill around sides and to top of pipe in accordance with Section 31 23 17.

B. Maintain optimum moisture content of bedding material to attain required compaction density.

3.09 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00

3.10 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

C. Perform pressure test on potable water distribution system in accordance with AWWA C600 and M 23.

D. Pressure test system in accordance with AWWA C600, M 23, and the following:

1. Test Pressure: Not less than 150 psi or 50 psi in excess of maximum static pressure, whichever is greater.
2. Conduct hydrostatic test for at least two-hour duration.
3. Fill section to be tested with water slowly, expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
4. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
5. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
6. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

E. Compaction Testing for Bedding: In accordance with ASTM D1557.

F. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

G. Frequency of Compaction Tests: every 300’ of trench for each lift.

END OF SECTION

SECTION 33 13 00

DISINFECTING OF POTABLE WATER PIPELINE SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Disinfection of potable water distribution and transmission system.
2. Testing and reporting.

B. Related Sections include but are not necessarily limited to:

1. Section 40 23 51 – Steel Pipe
2. Section 40 23 61 – Plastic Pipe

C. Measurement and Payment:

1. The contract lump sum price for the water system improvements shall include full compensation for all costs and work involved with disinfecting water distribution system piping and hydropneumatic tank.

1.02 REFERENCES

A. American Water Works Association (AWWA):

1. B300 – Hypochlorite.
2. B301 – Liquid Chlorine.
3. C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances.
4. C651 – Disinfecting Water Mains.
5. M23 – PVC Pipe – design and installation.

1.03 SUBMITTALS

A. See Section 01 33 00 – Submittal Procedures for general submittal requirements and content.

B. Product Data:

1. Submit procedures, proposed chemicals, and treatment levels for review.

C. Quality Assurance/Control:

1. Test Reports: Indicate results comparative to specified requirements.

a. Disinfection Report:

1) Type and form of disinfectant used.
2) Date and time of disinfectant injection start and time of completion.
3) Test locations.
4) Name of person collecting samples and State of California Certification.
5) Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
6) Date and time of flushing start and completion.
7) Disinfectant residual after flushing in ppm for each outlet tested.

b. Bacteriological Report:

1) Date issued, project name, and testing laboratory name, address, and telephone number.
2) Time and date of water sample collection.
3) Name of person collecting samples and Certification.
4) Test locations.
5) Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
6) Coliform bacteria test results for each outlet tested.
7) Certify water conforms, or fails to conform, to bacterial standards.

c. Water Quality Certificate:

1) Certify water conforms to quality standards of the State of California, suitable for human consumption.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with the State of California standards and AWWA C651.

B. Qualifications:

1. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section with minimum three (3) years documented experience.
2. Testing Firm: Company and individual specializing in testing potable water systems, certified by State of California.
3. Submit bacteriologist's signature and authority associated with testing.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

3.02 APPLICATION

A. Provide and attach required equipment to perform the Work of this section.

B. Maintain disinfectant in system for a minimum of 24-hours.

C. Flush, circulate, and clean until required cleanliness is achieved;

D. Replace permanent system devices removed for disinfection.

3.03 FIELD QUALITY CONTROL

A. Disinfection, Flushing, and Sampling:

1. Disinfect pipeline installation in accordance with AWWA C651.
2. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than 2 ppm.
3. Legally dispose of chlorinated water. Apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
4. After final flushing and before pipeline is connected to existing system, or placed in service, take two bacteriological tests in accordance with AWWA C651 and County Health Department. If test fail, flush and retest. If the test still fails, re-disinfect and reflush until system passes. Contractor to pay for all testing.

END OF SECTION

SECTION 33 31 13

SANITARY SEWER PIPE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sanitary sewer pipe and fittings starting 5-feet beyond the operations building.
   2. Wye branches and tees.
   3. Sanitary laterals.
   4. Connection to existing manholes.

B. See Section 22 00 00 – Plumbing for sewer piping within the building to 5-feet beyond.

C. Related Sections include but are not necessarily limited to:
   1. Section 03 30 00 – Cast-In-Place Concrete.
   2. Section 31 23 00 – Earthwork.
   3. Section 31 23 16 – Trenching Backfilling and Compaction.
   4. Section 33 01 32 – Sewer and Manhole Testing.
   5. Section 33 05 13 – Manholes and Structures

D. Measurement and Payment:
   1. The contract lump sum price shall include full compensation for all costs and work involved with furnishing and installing sanitary sewer pipe.

1.2 REFERENCES

A. ASTM International (ASTM):
   1. A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   2. C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
   3. C923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
   4. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
   5. D2729 – Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   6. D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   7. D3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
   8. F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

9. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
10. F679 – Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
11. F794 – Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
12. F949 – Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings.

B. AmericanAmericanAmerican National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
3. C150 – ANSI Standard for the Thickness Design of Ductile Iron Pipe.
4. C151 – American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
5. C153 – AmericaSUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for general submittal requirements and content.

B. Shop Drawings:
1. Indicate layout of sewer system and appurtenances. Show size, materials, components of system and burial depth.

C. Product Data:
1. Submit catalog cuts and other pertinent data indicating proposed materials, accessories, details, and construction information.

D. Quality Assurance:
1. Reports: Submit reports indicating field tests made and results obtained.
2. Instructions: Furnish Manufacturer's installation instructions and indicate special procedures required to install Products specified.
3. Manufacturer's Certificate: Certify products meet or exceed specified requirements of the State of California

E. Closeout Submittals:
1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
2. Project Record Documents: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Kern School District standards.

B. All materials shall be new and all similar materials shall be from the same manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 65 00 – Delivery, Storage, and Handling for general requirements.

B. Block individual and stockpiled pipe lengths to prevent moving.

1.6 FIELD MEASUREMENTS

A. Verify field measurements and elevations are as indicated.

1.7 COORDINATION

A. Coordinate the Work with Porterville College

B. Notify affected utility companies minimum of 72 hours prior to construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Pipe and Fittings:
   1. 4 through 15-inch: ASTM D3034, SDR 35 PVC.
   2. 18 though 27-inch: ASTM F679, SDR 35 PVC.

B. Joints:
   1. ASTM D3213 Push-on joints

C. Gaskets:
   1. ASTM F477elastomeric.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

A. Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.

B. Protect and support existing sewer lines, utilities, and appurtenances.

C. Maintain profiles of utilities. Coordinate with other utilities to eliminate interference. Notify ENGINEER where crossing conflicts occur.

3.3 PIPE INSTALLATION

A. Excavate pipe trench in accordance with Section 31 23 16 – Trenching, Backfill, and Compaction.

B. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

C. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches, and compact to 90 percent.

D. Install pipe, fittings, and accessories in accordance with ASTM D2321. Lay pipe to slope gradients noted on drawings; with maximum variation from indicated slope of 1/8-inch in 10-feet. Begin at downstream end and progress upstream laying bell and spigot pipe with bells upstream.

E. Place pipe in a shaped bed of material. Excavate suitable bell holes so entire barrel of pipe rests on the bedding material.

F. Keep pipe and fittings clean until work is completed and accepted by /Engineer. Cap open ends during periods of work stoppage.

3.4 INSTALLATION OF WYE BRANCHES AND TEES

A. Install wye branches or pipe tees at locations indicated on Drawings concurrent with pipe laying operations. Use standard fittings of same material and joint type as sewer main.

B. Maintain minimum 5-feet separation distance between wye connection and manhole.

C. Use saddle wye or tee with stainless steel clamps for taps into existing piping. Mount saddles with solvent cement or gasket and secure with metal bands. Layout holes with template and cut holes with mechanical cutter.

3.5 INSTALLATION - SANITARY LATERALS

A. Construct laterals from wye branch to terminal point at 5-feet from building.

B. Maintain 3-feet minimum depth of cover over pipe.

C. Install watertight plug, braced to withstand pipeline test pressure thrust, at termination of lateral. Install temporary marker stake extending from end of lateral to 12 inches above finished grade. Paint top 6 inches of stake with fluorescent orange paint.

3.6 CONNECTION TO MANHOLES

A. Connect to manholes in accordance with Section 33 05 13 – Manholes and Structures.

3.7 BACKFILLING

A. Backfill around sides and to top of pipe with cover fill in maximum lifts of 8 inches, tamp in place and compact to 90 percent. Maintain optimum moisture content of bedding material to attain required compaction density.

B. Backfill around sides and to top of pipe in accordance with Section 31 23 16 – Trenching, Backfill, and Compaction.

C. Install tracer wire and warning tape per Section 40 05 13 –General Pipe Requirements, Couplings, and Accessories.

3.8 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Pressure Test: Test in accordance with Section 33 01 32 – Sewer and Manhole Testing.

C. Infiltration Test: Test in accordance with Section 33 01 32 – Sewer and Manhole Testing.

D. Deflection Test: Test in accordance with Section 33 01 32 – Sewer and Manhole Testing.

E. Request inspection prior to placing bedding.

F. When tests indicate Work does not meet specified requirements, remove work, replace, and retest.

G. Frequency of Compaction Tests on site work. One test for each lift for each 500-LF of pipe or fraction thereof.

H. Provide Sewer video record in accordance with State Standards.

3.9 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33 41 13

STORM DRAIN PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Storm drain piping and accessories.

B. Related Sections include but are not necessarily limited to:
   1. Section 03 30 00 – Cast-In-Place Concrete: Concrete type for catch basin manhole foundation slab construction.
   2. Section 03 60 00 – Grout.
   3. Section 31 23 00 – Earthwork.
   4. Section 31 23 16 – Trenching Backfilling and Compaction.
   5. Section 33 05 13 – Manholes and Structures.
   6. Section 40 05 50 – Process Valves

C. Measurement and Payment:
   1. The contract lump sum price shall include full compensation for all costs and work involved with furnishing and installing storm drain piping and appurtenances.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):
   1. M86 – Concrete, Sewer, Storm Drain, and Culvert Pipe.
   2. M170 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
   3. M198 – Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets.
   4. M252 – Corrugated Polyethylene Drainage Tubing.
   5. M278 – Class PS 50 Polyvinyl Chloride (PVC) Pipe.
   6. M288 – Geotextiles.

B. ASTM International (ASTM):
   1. A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   2. A746 – Standard Specification for Ductile Iron Gravity Sewer Pipe.
   3. C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
   4. C361, Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
   5. C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
   6. C655, Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe.
   7. C969 – Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

8. C924 – Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
9. D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
10. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
11. D2729 – Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
12. D2922 – Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
13. D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
14. D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
15. F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. American Water Works Association (AWWA):
1. M9, Installation of Concrete Pipe.

1.3 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for general submittal requirements and content.

B. Product Data:
1. Submit manufacturer's technical product data and installation instructions for storm drainage system materials and products.

C. Maintenance Data:
1. Submit maintenance data and parts lists for storm drainage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 1 – General Requirements.

D. Shop Drawings:
1. Pipe: Before fabrication, submit for approval plans showing pipe dimensions, joints, reinforcement and other details.
2. Shop Drawings: Concrete Box Culverts: Submit for approval shop drawings for fabrication, bending, and placement of concrete reinforcement showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of bars. Include special bars required about openings. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures". Also submit for approval working plans and design calculations for false work; the design shall comply with Caltrans Standard Specifications, Subsection 51-1.06 False work.

E. Quality Assurance:
1. Design Data:
a. Submit design calculations that provide evidence as to the adequacy of the design of pipe proposed for use in the Work. The evidence must be

approved in writing by the Engineer before the pipe for the project is manufactured.

2. Certificates:
    a. Mill Certificates: Reinforcing: Submit 2 copies of steel producer's certificates of mill tests for reinforcing steel which indicates that the reinforcing steel meets specified requirements.
    b. Mill Certificates: Cement: Submit 2 copies of manufacturer's certification for each shipment of cement used in the manufacturing of pipe indicating that the chemical composition of the cement meets the requirements of ASTM C l50.
    c. Laboratory's Certificate: Pipe: Before delivering pipe to the job site, submit an independent testing laboratory report certifying that the pipe and fittings are in accordance with ASTM Standards herein referenced. Forward copies of these reports to the Engineer; no pipe will be accepted without these reports.
    d. Aggregates: Submit 2 copies of manufacturer's certificates for fine and course aggregates indicating that grading, soundness and abrasion meet the requirements of ASTM C33.
3. Test Reports:
    a. Absorption Test Reports: Submit test reports, which demonstrate and certify that the absorption test requirements for pipe to be used on this project are in accordance with ASTM C76.
    b. 3-Edge and Crush Test Results: Submit test reports, which demonstrate and certify that the test requirements for pipe to be used on this project are in accordance with ASTM C76.

F. Closeout Submittals:
1. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
2. Project Record Documents:
    a. Accurately record actual locations of pipe runs, connections, manholes, inlets, catch basins, and invert elevations.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the State of California

B. Qualifications:
1. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years documented experience.
2. Installer: Company specializing in performing work of this section with minimum three years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 65 00 – Delivery, Storage, and Handling for general requirements.

B. Block individual and stockpiled pipe lengths to prevent moving.

C. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

D. Do not place pipe flat on ground. Cradle to prevent point stress.

E. Store UV sensitive materials out of direct sunlight.

PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Reinforced Concrete Pipe: ASTM C76, Class III with Wall Type B; bar reinforcement; inside nominal diameter of inches per plan, bell and spigot ends.
   1. Fittings: Reinforced concrete.
   2. Joints: ASTM C443 rubber compression gasket.

B. Substitution (Only if approved by Engineer):
   1. Pipe: ASTM D3034, SDR 35, PVC inside nominal diameter of inches per plans, bell and spigot style rubber ring sealed gasket joint.
   2. Fittings: PVC.
   3. Joints: ASTM F477, elastomeric gaskets.

2.2 DRAINAGE STRUCTURES

A. Drainage Structures: Precast and cast-in-place concrete, as specified in Section 33 05 13 – Manholes and Structures.
   1. Manholes: 48-inches diameter, depth per plan feet deep, cast iron covers inscribed with “STORM SEWER” per Kern School District standards

2.3 SOURCE QUALITY CONTROL

A. Conduct testing methods to evaluate physical properties of pipe in full compliance with ASTM C497. Report full results test showing compliance with referenced standard.

B. Determine acceptability of RCP in all diameters and classes by the following tests:
   1. Conduct three-edged bearing test as specified to determine the loading to produce a 0.01-inch crack extending 12-inches or more.
      a. Complete bearing test prior to shipment date of lot tested.
   2. Conduct crushing test, as specified on cured concrete cylinders.
      a. Achieve specified 28-day design compressive strength prior to shipment date of lot tested.

PART 3 EXECUTION

3.1 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones and other hard or organic matter capable of damaging piping or impeding consistent backfilling or compacting.

3.2 EXCAVATION AND BEDDING

A. Excavate pipe trench in accordance with Section 31 23 16 –Trenching Backfill, and Compaction. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Dewater excavations to maintain dry conditions to preserve final grades at bottom of excavation.

C. Provide sheeting and shoring in accordance with Section 31 23 16 –Trenching Backfill, and Compaction.

D. Place bedding material at trench bottom, level materials in continuous layers not exceeding 8 inches compacted depth.

E. Install pipe on compacted subgrade meeting bedding requirements. Cradle bottom 20 percent of diameter to avoid point load.

3.3 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

B. Place pipe on minimum 4-inch-deep bed of bedding, or compacted subgrade meeting bedding requirements.

C. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8-inch in 10-feet. Connect pipe to drainage structures.

D. Refer to Section 31 23 16 –Trenching Backfill, and Compaction for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

3.4 FIELD QUALITY CONTROL

A. Request inspection prior to placing aggregate cover over pipe.

B. Compaction Testing: In accordance with ASTM D1557.

C. When tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Compaction Tests: Every 100-feet.

E. Infiltration Test: Test in accordance with ASTM 969.

F. Pressure Test: Test in accordance with ASTM C924 and ASTM 1103, depending on size of pipe.

G. Provide video record in accordance with City of Fresno standards.

3.5 PROTECTION OF FINISHED WORK

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is complete.
   1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
   2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION

APPENDIX NO. 1

GEOTECHNICAL REPORT

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED ALLIED HEALTH BUILDING
PORTERVILLE COLLEGE
100 EAST COLLEGE AVENUE
PORTERVILLE, CALIFORNIA

PROJECT NO. 012-19207
FEBRUARY 3, 2020

Prepared for:

MR. JOE DEROSA
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Krazan & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

February 3, 2020

KA Project No. 012-19207

Mr. Joe DeRosa
Kern Community College District
2100 Chester Avenue, Suite 201
Porterville, California 93301

RE: Geotechnical Engineering Investigation
Proposed Allied Health Building
Porterville College
100 East College Avenue
Porterville, California

Dear Mr. DeRosa:

In accordance with your request, we have completed a Geotechnical Engineering Investigation for the above-referenced site. The results of our investigation are presented in the attached report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 348-2200.



Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

DRJ:ht

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February 3, 2020 KA Project No. 012-19207

GEOTECHNICAL ENGINEERING INVESTIGATION
ALLIED HEALTH BUILDING
PORTERVILLE COLLEGE
100 EAST COLLEGE AVENUE
PORTERVILLE, CALIFORNIA

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed Allied Health Building to be located at Porterville College, 100 East College Avenue in Porterville, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls and soil cement reactivity.

A site plan showing the approximate boring locations is presented following the text of this report. A description of the field investigation, boring logs, and the boring log legend are presented in Appendix A. Appendix A contains a description of the laboratory testing phase of this study, along with the laboratory test results. Appendix B contains a guide to earthwork specifications. When conflicts in the text of the report occur with the general specifications in the appendices, the recommendations in the text of the report have precedence.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the soil and groundwater conditions at the site, to make geotechnical engineering recommendations for use in design of specific construction elements, and to provide criteria for site preparation and Engineered Fill construction.

Our scope of services was outlined in our proposal dated October 28, 2019 (KA Proposal No. P693-19) and included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.
- A review of available data for evaluation of subsurface conditions at the project site.
- A field investigation consisting of drilling 5 borings to depths of approximately 20 to 24 feet for evaluation of the subsurface conditions at the project site. The deeper borings were terminated due to auger refusal in cobbles.

- Performing laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.

- Evaluation of the data obtained from the investigation and an engineering analysis to provide recommendations for use in the project design and preparation of construction specifications.

- Preparation of this report summarizing the results, conclusions, recommendations, and findings of our investigation.

PROPOSED CONSTRUCTION

It is understood the development will consist of a new single-story building with a footprint area of approximately 23,200 square feet. It is anticipated the structure will be supported on conventional shallow foundations and will utilize concrete slab-on-grade. Foundation loads are anticipated to be light to moderate. On-site concrete flatwork areas and landscaping are also planned.

In the event, these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION AND SITE DESCRIPTION

Porterville College is located within the southern portion of the San Joaquin Valley, within the southern portion of the City of Porterville, California. The building site is located approximately 1,200 feet northeast of the intersection of East College Avenue and South Main Street, and has an address of 100 East College Avenue. The building site is irregular in shape and encompasses approximately 23,200 square feet within the central portion of the school campus. The proposed building site is located in a landscaped area surrounded by existing school buildings. Tennis Courts are located to the south; the Physical Education building is located to the west; the Allied Health Relocatable buildings are located to the north; and softball fields are located to the east. The Tule River is located approximately 2,500 feet north of the site.

Presently, the proposed building site predominately consists of landscaped areas. An electrical yard and a chiller yard are located adjacent west and southeast of the building site, respectively. The site is covered in turf and the surface soils have a loose consistency. Buried utility lines are associated with the existing development and extend alongside and beneath the project site. The area of proposed development is relatively level with no major changes in grade.

GEOLOGIC SETTING

The San Joaquin Valley, which includes the Porterville area, is a topographic and structural basin that is bounded on the east by the Sierra Nevada and on the west by the Coast Ranges. The Sierra Nevada, a fault block dipping gently southwestward, is made up of igneous and metamorphic rocks of pre-Tertiary age that comprise the basement complex beneath the Valley. The Coast Ranges contain folded and faulted sedimentary rocks of Mesozoic and Cenozoic age, which are similar to those rocks that underlie the Valley at depth and non-conformably overlie the basement complex; gently dipping to nearly

horizontal sedimentary rocks of Tertiary and Quaternary age overlie the older rocks. These younger rocks are mostly of continental origin and in the Porterville area, they were derived from the Sierra Nevada.

The Tule River is the principal river in the area. Alluvial fans formed by this river are the largest geomorphic features in the Porterville area. The formation of the fans has resulted in rather flat regional topography.

The Coast Ranges evolved as a result of folding, faulting, and accretion of diverse geologic terrains. They are composed chiefly of sedimentary and metamorphic rocks that are sharply deformed into complex structures. They are broken by numerous faults, the San Andreas Fault being the most notable structural feature.

Both the Sierra Nevada and Coast Range are geologically young mountain ranges and possess active and potentially active fault zones. Major active faults and fault zones occur at some distance to the east, west, and south of the Porterville area. The Owens Valley Fault Zone bounds the eastern edge of the Sierra Nevada block and contains both active and potentially active faults.

There are no active fault traces in the project vicinity. Accordingly, the project area is not within an Earthquake Fault Zone (Special Studies Zone) and will not require a special site investigation by an Engineering Geologist.

Porterville residents could feel the effects of a large seismic event on one of the nearby active or potentially active fault zones. Porterville has experienced groundshaking from earthquakes in the historical past. According to the Five County Seismic Safety Element, groundshaking of VII intensity (Modified Mercali Scale) was felt in Porterville from the 1872 Owens Valley Earthquake. This is the largest known earthquake event affecting the Porterville area.

FIELD AND LABORATORY INVESTIGATIONS

A subsurface soil investigation consisting of exploratory drilling was performed at the site on November 26, 2019. Subsurface soil conditions were explored by drilling 5 borings to depths ranging from approximately 20 to 24 feet below existing site grade, using a truck-mounted drill rig. The deeper borings were terminated at shallow depths due to auger refusal in gravel and cobbles. The approximate boring locations are shown on the site plan. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency and to obtain information regarding the engineering properties of the subsoils. Soil samples were retained for laboratory testing. The soils encountered were continuously examined and visually classified in accordance with the Unified Soil Classification System. A more detailed description of the field investigation is presented in Appendix A.

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing program was formulated with emphasis on the evaluation of natural moisture, density, gradation, shear strength, and one-dimensional consolidation of the

materials encountered. Details of the laboratory test program and results of the laboratory tests are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, approximately 1½ to 3 feet of fill material was encountered within several of the borings drilled throughout the site. The fill material predominately consisted of silty sand. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that the fill soils had varying strength characteristics ranging from loosely placed to compacted.

In areas where fill material was not encountered, the surface soils consisted of approximately 6 to 12 inches of very loose silty sand. These soils are disturbed, non-expansive, non-plastic, have low strength characteristics, and are highly compressible when saturated.

Below the loose surface soils and fill material, approximately 2 to 4 feet of loose to medium dense silty sand was encountered. Field and laboratory tests suggest that these soils are non-expansive, non-plastic, moderately strong and slightly to moderately compressible. Penetration resistance ranged from 9 to 20 blows per foot. Dry densities ranged from 91 to 99 pcf. Fines contents ranged from 40 to 41 percent. Representative soil samples consolidated approximately 2½ to 4½ percent under a 2 ksf load when saturated. A representative soil sample had an angle of internal friction of 29 degrees.

Below 4½ to 5 feet, predominately loose to medium dense silty sand, silty sand/sand and sandy silt were encountered. These soils contained trace amounts of gravel and/or cobbles. Field and laboratory tests suggest that these soils are non-expansive, non-plastic, moderately strong and slightly compressible. Penetration resistance ranged from 8 to 25 blows per foot. Dry densities ranged from 88 to 113 pcf. Fines contents ranged from 6 to 57 percent. These soils had slightly stronger strength characteristics than the upper soils and extended to termination depth of our borings.

For additional information about the soils encountered, please refer to the logs of borings in Appendix A.

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Free groundwater was encountered at a depth of 15 feet below existing site grade within the soil borings advanced during our subsurface investigation. Review of the Department of Water Resources groundwater level readings indicates that historic high groundwater within the project site and vicinity has been as shallow as 9 feet below site grade.

It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use and climatic conditions, as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

SOIL LIQUEFACTION

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs in soils such as sand in which the strength is purely friction. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by seismic event.

To evaluate the liquefaction potential of the site, the following items were evaluated:

1) Groundwater depth;

2) Soil type;

3) Relative density;

4) Initial confining pressure;

5) Intensity and duration of groundshaking.

The soils encountered within a depth of 24 feet on the project site predominately consist of loose to very dense silty sand and silty sand/sand with some gravel and cobbles. Groundwater was encountered at a depth of 15 feet below existing site grade within the soil borings advanced during our subsurface exploration. Available groundwater data, as well as our experience in the area, indicates that groundwater depth has been as shallow as 9 feet within the project site vicinity.

The potential for soil liquefaction during a seismic event was evaluated using the LIQUEFYPRO computer program (version 5.8h) developed by CivilTech Software. For the analysis, a maximum earthquake magnitude of 6.15 was used. A peak horizontal ground surface acceleration of 0.341g was considered conservative and appropriate for the liquefaction analysis. An estimated high groundwater depth of 9 feet was used for our analysis. The computer analysis indicates that soils above a depth of 9 feet are non-liquefiable due to the absence of groundwater. The soils below a depth of 9 feet have a slight to moderate potential for liquefaction under seismic shaking. Therefore, liquefaction is considered a potential geologic hazard at the subject site.

The analysis indicates that the estimated total seismic induced settlement is estimated to be approximately 3 inches. Differential settlement caused by a seismic event is estimated to be less than 2 inches. The anticipated differential settlement is estimated over a horizontal distance of 100 feet.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our field and laboratory investigations, along with previous geotechnical experience in the project area, the following is a summary of our evaluations, conclusions, and recommendations.

Administrative Summary

In brief, the subject site and soil conditions, with the exception of the very loose surface soils, fill material, moderately compressible upper soils, and surrounding development, appear to be conducive to the development of the project. The surface soils have a very loose consistency. These soils are disturbed, have low strength characteristics and are highly compressible when saturated. Accordingly, it is recommended that the surface soils be recompacted. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Approximately 1½ to 3 feet of fill material was encountered within several of the borings drilled throughout the site. The fill material predominately consisted of silty sand. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that the fill soils were predominately loosely placed and not properly compacted. Therefore, it is recommended that the fill soils be excavated and stockpiled so that the native soils can be properly prepared. Preliminary testing indicates the fill material will be suitable for reuse as Engineered Fill, provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension.

Several structures are located within the project site vicinity. Associated with these developments are buried structures such as utility lines and landscape irrigation lines that may extend into the project site. Any buried structures, including utilities or loosely backfilled excavations, encountered during construction should be properly removed and the resulting excavations backfilled. It is suspected that demolition activities of the existing structures will disturb the upper soils. After demolition activities, it is recommended that these disturbed soils be removed and/or recompacted. Excavations, depressions, or soft and pliant areas extending below planned finished subgrade levels should be cleaned to firm, undisturbed soil and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Existing concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures should be removed in accordance with the recommendations of the Soils Engineer. Resulting excavations should be backfilled with Engineered Fill.

The upper, on-site native soils are loose and moderately compressible under saturated conditions. In order reduce the amount of differential settlement and provide uniform support for the planned buildings, it is recommended that following stripping operations, fill removal, and demolition activities, the exposed native soil within proposed building areas be over-excavated to a depth of at least 3 feet, worked until uniform and free from large clods, moisture-conditioned to at or above optimum moisture content, and compacted to a minimum of 90 percent of maximum density based on ASTM Test Method

D1557. In addition, it is recommended that the proposed structure foundations, including ancillary structures, such as site walls or trash enclosures, be supported by a minimum of 2 feet of Engineered Fill. Limits of recompaction should extend 5 feet beyond structural elements. Prior to fill placement, the exposed subgrade soils should be proofrolled and observed by Krazan & Associates, Inc. to verify stability. Soft or pliant areas should be excavated to firm native ground. Fill material should be compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Relatively clean sands were encountered at various locations throughout the site. The possibility exists that site grading operations could expose these soils in areas of proposed buildings, pavements, and/or retaining walls. The Contractor should note that these soils lack the cohesion necessary to stand vertically, even in shallow excavations such as footing trenches. If these conditions are encountered, it will be necessary to over-excavate the affected area(s) to a minimum of 2 feet below the proposed bearing surface. These areas may be backfilled using a mix of the silty sand and sand soils that contains at least 20 percent fines and meeting the requirements for Engineered Fill. This material may be obtained from elsewhere at the site, imported to the site from an approved off-site source, or manufactured through blending of the excavated clean sand with other suitable material containing a higher percentage of fines to result in material meeting the requirements for Engineered Fill.

Sandy and gravelly soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy and gravelly soils.

Based on the soil liquefaction analysis performed within the site, the estimated total seismic-induced settlement is approximately 3 inches. Differential settlement caused by a seismic event is estimated to be less than 2 inches. The anticipated differential settlement is estimated over a horizontal distance of 100 feet. The seismic settlements would develop if liquefaction of the underlying saturated subsoils were to occur during a seismic event. If the differential settlement is not within tolerable limits, in order to reduce the estimated differential settlement associated with seismic settlement, it is recommended the planned structure be supported on geogrid reinforced Engineered Fill. Recommendations for utilizing geogrid reinforced soil are provided in this report.

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structure footings may be designed utilizing a net allowable bearing pressure of 3,000 psf for dead-plus-live loads. Footings should have a minimum embedment of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower.

Groundwater Influence on Structures/Construction

During our recent field investigation groundwater was encountered at a depth of 15 feet. However, historically groundwater has been encountered at depths as shallow as 9 feet below existing site grade. If groundwater is encountered, our firm should be consulted prior to dewatering the site. Installation of a standpipe piezometer is suggested prior to construction should groundwater levels be a concern.

In addition to the groundwater level if earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, "pump," or not respond to densification techniques. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Site Preparation - General

General site clearing should include removal of vegetation; existing utilities; structures including foundations, basement walls and floors; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for reuse as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Approximately 1½ to 3 feet of fill material was encountered within several of the borings drilled throughout the site. The fill material predominately consisted of silty sand. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that the fill soils were predominately loosely placed and not properly compacted. Therefore, it is recommended that the fill soils be excavated and stockpiled so that the native soils can be properly prepared. Preliminary testing indicates the fill material will be suitable for reuse as Engineered Fill, provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension.

Several structures are located within the project site vicinity. Associated with these structures may be buried structures, such as utility lines that may extend into the project site. Any buried structures or loosely backfilled excavations encountered during construction should be properly removed and the resulting excavations backfilled. Excavations, depressions, or soft and pliant areas extending below planned finished subgrade levels should be cleaned to firm, undisturbed soil and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Existing concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

Mitigation measures are recommended to reduce the potential for excessive soil settlement. It is recommended that following stripping operations, fill removal, and demolition activities, the upper 3 feet of native soils within the proposed building areas be excavated, worked until uniform and free from large clods, moisture-conditioned to at or above optimum moisture content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that proposed structure foundations, including ancillary structures such as site walls or

trash enclosures, be supported by a minimum of 24 inches of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond proposed footing lines. Prior to fill placement, the exposed subgrade soils should be proofrolled and observed by Krazan & Associates, Inc. to verify stability. Soft or pliant areas should be excavated to firm native ground. Fill material should be compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Following stripping and demolition activities, it is recommended that the upper 12 inches of subgrade soils within the proposed exterior flatwork areas be excavated, moisture-conditioned to at or above optimum moisture content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Prior to backfilling, the bottom of the excavation should be proofrolled and observed by Krazan & Associates, Inc. to verify stability. Soft or pliant areas should be excavated to firm native ground.

Relatively clean sands were encountered at various locations throughout the site. The possibility exists that site grading operations could expose these soils in areas of proposed buildings, pavements, and/or retaining walls. The Contractor should note that these soils lack the cohesion necessary to stand vertically, even in shallow excavations such as footing trenches. If these conditions are encountered, it will be necessary to over-excavate the affected area(s) to a minimum of 2 feet below the proposed bearing surface. These areas may be backfilled using a mix of the silty sand and sand soils that contains at least 20 percent fines and meeting the requirements for Engineered Fill. This material may be obtained from elsewhere at the site, imported to the site from an approved off-site source, or manufactured through blending of the excavated clean sand with other suitable material containing a higher percentage of fines to result in material meeting the requirements for Engineered Fill.

The upper soils, during wet winter months, become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Supplemental Site Preparation - Geogrid Option

Subsurface soils within the site are prone to liquefaction under high groundshaking acceleration during an earthquake. The building area should be excavated to a depth of 5 feet below the bottom of the deepest foundation and the resulting excavation should be backfilled with a layered system of Engineered Fill and geogrid reinforcement.

The first layer of geogrid reinforcement will be placed directly at the bottom of the excavation. The geogrid material should be overlapped a minimum of 3 feet in all directions. The geogrid strips should be "shingled" such that the exposed geogrid edge is opposite the direction of fill placement (as roof shingles to rain runoff). The interlock between the geogrid and Engineered Fill will provide load transfer. No vehicles may traverse the geogrid prior to placement of the Engineered Fill cover.

The next layer of geogrid should be placed on top of the compacted Engineered Fill. This and subsequent layers need only be overlapped a minimum of 1 foot on all sides. The geogrid strips of this layer, and all subsequent layers within the footprint, should be placed with lengths perpendicular to those in the layer immediately below. The fill soils excavated from the area beneath the structure may be moisture-conditioned and recompacted between geogrid layers as reinforced fill. The reinforced fill should be conditioned to near optimum moisture and recompacted to a minimum of 90 percent of maximum density based on ASTM D1557 Test Method.

A total of 5 geogrid layers, including the layer at the base of the excavation, should be installed at vertical increments of 1 foot. The geogrid layers should extend to a minimum of 5 feet beyond the exterior footing perimeter of the structure. The geogrid reinforcement fabric should consist of Tensar® BX 6100 Geogrid, TriAx TX-5 or equivalent. Any unstable soils within building areas should be excavated and backfilled with Engineered Fill as requested by the Soil Engineer.

It is recommended that the entire building site be excavated at once, and soils be stockpiled. The geogrid and excavated soil may then be placed and recompacted as recommended herein. Alternatively, the Contractor may elect to excavate the site in two stages, where excavated soil can be stockpiled over one-half of the site while the other half is mitigated. However, if the Contractor elects the option of two stages over the preferred option of using one stage, a minimum of 5 feet of geogrid from the first half should overlap the second half. Furthermore, the overlapping geogrid should be protected from damages, which may be caused by operating equipment. It is further recommended that flexible utility connections be used for the project.

Engineered Fill

The on-site soils are predominately silty sand and silty sand/sand. These soils are intermixed with varying amounts of gravel and cobbles. These soils will be suitable for reuse as non-expansive Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum size.

Relatively clean sands were encountered at various locations throughout the site. The possibility exists that site grading operations could expose these soils in areas of proposed buildings, pavements, and/or retaining walls. The Contractor should note that these soils lack the cohesion necessary to stand vertically, even in shallow excavations such as footing trenches. If these conditions are encountered, it will be necessary to over-excavate the affected area(s) to a minimum of 2 feet below the proposed bearing surface. These areas may be backfilled using a mix of the silty sand and sand soils that contains at least 20 percent fines and meeting the requirements for Engineered Fill. This material may be

obtained from elsewhere at the site, imported to the site from an approved off-site source, or manufactured through blending of the excavated clean sand with other suitable material containing a higher percentage of fines to result in material meeting the requirements for Engineered Fill.

The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since he has complete control of the project site at that time.

Imported Fill should consist of a well-graded, slightly cohesive, fine silty sand or sandy silt, with relatively impervious characteristics when compacted. This material should be approved by the Soils Engineer prior to use and should typically possess the following characteristics:

Percent Passing No. 200 Sieve	20 to 50
Plasticity Index	10 maximum
UBC Standard 29-2 Expansion Index	15 maximum

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to at or above optimum moisture content, and compacted to achieve at least 90 percent of maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required density or if soil conditions are not stable.

Drainage and Landscaping

The ground surface should slope away from building pad and pavement areas toward appropriate drop inlets or other surface drainage devices. In accordance with Section 1804 of the 2019 California Building Code, it is recommended that the ground surface adjacent to foundations be sloped a minimum of 5 percent for a minimum distance of 10 feet away from structures, or to an approved alternative means of drainage conveyance. Swales used for conveyance of drainage and located within 10 feet of foundations should be sloped a minimum of 2 percent. Impervious surfaces, such as pavement and exterior concrete flatwork, within 10 feet of building foundations should be sloped a minimum of 1 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practices following OSHA (Occupational Safety and Health Administration) standards by a Contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the Contractor. Traffic and vibration adjacent to trench walls should be minimized; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced; especially during or following periods of precipitation.

Sandy and gravelly soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy and gravelly soils.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 90 percent of maximum density based on ASTM Test Method D1557. Utility trench backfill placed in pavement areas should be compacted to at least 90 percent of the maximum density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

The Contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The Contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Underground utility lines near foundations should be placed such that the utility trench does not encroach within a 1:1 line of load dispersion emanating outward and downward from the lower corner of the footing. Utility trenches parallel to footings should be a minimum distance of 18 inches from the outer edge of the footing.

Foundations

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structures may be supported on a shallow foundation system bearing on a minimum of 2 feet of Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable net soil bearing pressures:

Load	Allowable Loading
Dead Load Only	2,250 psf
Dead-Plus-Live Load	3,000 psf
Total Load, including wind or seismic loads	4,000 psf

Footing design may also be performed using a modulus of subgrade reaction (k_s) of 62 pci. The footings should have a minimum embedment depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 12 inches, regardless of load.

The footing excavations should not be allowed to dry out at any time prior to pouring concrete. It is recommended that all footings be reinforced by at least one No. 4 reinforcing bar in both top and bottom.

The total settlement caused by static loads is not expected to exceed 1 inch. Differential settlement associated with static loads should be less than ½ inch over a horizontal distance of 30 feet. Most of the movement is expected to occur during construction as the loads are applied. However, additional post-construction movement may occur if the foundation soils are flooded or saturated.

The estimated total seismic-induced settlement is not anticipated to exceed 3 inches. Differential settlement associated with a seismic event is estimated to be less than 2 inches. Differential settlement caused by a seismic event is estimated to be less than 1 inch based on the structure being supported on geogrid reinforced Engineered Fill. The anticipated differential settlement is estimated over a horizontal distance of 100 feet. The seismic settlements would develop if liquefaction of the underlying saturated subsoils were to occur during a seismic event.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.35 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 300 pounds per cubic foot, up to a maximum of 3,000 psf, acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the above values, including combined frictional and passive resistance, may be used for short duration, wind, or seismic loads.

Pole-Type Foundations

Pole foundations may be designed as friction piers using an allowable sidewall friction of 300 psf. End bearing should be neglected. This value is for dead-plus-live loads. This value may be increased ⅓ for short duration loads, such as wind or seismic. The upper 2 feet should be neglected from friction calculations. Uplift loads can be resisted by caissons using an allowable sidewall friction of 165 psf of the surface area plus the weight of the pier. The total and differential settlements of the piers are not expected to exceed ½ inch. Most of the settlement is expected to occur during construction as the loads are applied.

Pole foundations may be designed using a lateral bearing capacity of 150 psf/ft using the applicable formulas for unconstrained or constrained conditions in the 2019 California Building Code, provided that the pole foundations have minimum embedment depth of 8 feet. This value can be doubled if a lateral deflection of ½-inch is acceptable.

Excavation Stability

Temporary excavations planned for the construction of the building and other associated structures may be excavated, according to the accepted engineering practices following Occupational Safety and Health Administration (OSHA) standards by a Contractor experienced in such work. Open, unbraced excavations in undisturbed soils should be made according to the table below.

Recommended Excavation Slopes	
Depth of Excavation (ft)	**Slope (Horizontal:Vertical)**
	Temporary
0-5	1½:1
5-10	1½:1
10-15	1¾:1
15+	2:1

If, due to space limitation, excavation near existing structures or roads is performed in a vertical position, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavation and installation. A specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction. The lateral pressures provided below may be used in the design of a braced-type shoring system.

Recommended Lateral Earth Pressure for Braced Shoring	
Depth of Excavation Below Ground Surface (feet)	**Lateral Soil Pressure (psf)**
0	35 H
0.25 H	35 H
H	35 H
Where H is the total depth of the excavation in feet.	

The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given above.

Since the Contractor has the ultimate responsibility for excavation stability, he may design a different shoring system for the excavation.

The excavation/shoring recommendations provided herein are based on soil characteristics derived from limited test borings within the site. Variations in soil conditions will likely be encountered during the excavations. Krazan & Associates, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation.

Floor Slabs and Exterior Flatwork

In areas that will utilize moisture-sensitive floor coverings, concrete slab-on-grade floors should be underlain by a water vapor retarder. The water vapor retarder should be installed in accordance with accepted engineering practice. The water vapor retarder should consist of a vapor retarder sheeting

underlain by a minimum of 3 inches of compacted, clean, gravel of ¾-inch maximum size. To aide in concrete curing an optional 2 to 4 inches of granular fill may be placed on top of the vapor retarder. The granular fill should consist of damp clean sand with at least 10 to 30 percent of the sand passing the 100 sieve. The sand should be free of clay, silt, or organic material. Rock dust which is manufactured sand from rock crushing operations is typically suitable for the granular fill. This granular fill material should be compacted.

Minimum slab thickness should be 6 inches, with minimum reinforcement consisting of #3 rebar spaced at 18 inches on-center each way. Thicker slabs and more robust reinforcement may be necessary depending on loading conditions, and should be evaluated by the slab designer. ACI 302 recommends that contraction joints be provided at 24 to 36 times the slab thickness in both directions unless intermediate cracks are acceptable, and should be evaluated by the slab designer. We recommend a minimum vapor barrier membrane thickness of 15 mil, such as Stego Wrap or other similar product. The vapor barrier selection should be made by the slab designer and should be installed in strict adherence to manufacturer's specifications.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. All fills required to bring the building pads to grade should be Engineered Fills.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To reduce moisture vapor intrusion, it is recommended that a vapor retarder be installed. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to reduce the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

Lateral Earth Pressures and Retaining Walls

Walls retaining horizontal backfill and capable of deflecting a minimum of 0.1 percent of its height at the top may be designed using an equivalent fluid active pressure of 45 pounds per square foot per foot of depth. Walls that are incapable of this deflection or walls that are fully constrained against deflection may be designed for an equivalent fluid at-rest pressure of 65 pounds per square foot per foot per depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1 (horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways.

For seismic design, an incremental seismic earth pressure value of 15 pcf may be used in combination with the active pressure, but need not be included for the at-rest condition. For 2:1 (horizontal:vertical) sloping backfill behind retaining walls, we recommend using an active pressure value of 71 psf/ft.

Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches wide and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic concrete or other suitable backfill to minimize surface drainage into the wall drain system. The aggregate should conform to Class 2 permeable materials graded in accordance with Section 68-2.02F(3) of the CalTrans Standard Specifications (2018). Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The pipes should be placed no higher than 6 inches above the heel of the wall in the centerline of the drainage blanket and should have a minimum diameter of 4 inches. Collector pipes may be either slotted or perforated. Slots should be no wider than ⅛ inch, while perforations should be no more than ¼ inch in diameter. If retaining walls are less than 6 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 4-inch diameter holes (concrete walls) or unmortared head joints (masonry walls) and not be higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to Section 88-1.02 of the CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

Seismic Parameters – 2019 California Building Code

The Site Class per Section 1613A of the 2019 California Building Code (2019 CBC) and ASCE 7-16, Chapter 20 is based upon the site soil conditions. It is our opinion that a Site Class D is most consistent with the subject site soil conditions. For seismic design of the structures based on the seismic provisions of the 2019 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Section 1613A.2.2
Site Coefficient F_a	1.332	Table 1613A.2.3 (1)
S_s	0.585	Section 1613A.2.1
S_{MS}	0.779	Section 1613A.2.3
S_{DS}	0.519	Section 1613A.2.4
Site Coefficient F_v	2.148	Table 1613A.2.3 (2)
S_1	0.226	Section 1613A.2.1
S_{M1}	0.485	Section 1613A.2.3
S_{D1}	0.323	Section 1613A.2.4
T_S	0.622	Section 1613A.2

* Based on ASCE 7-16, Chapter 11, Section 11.4.8 Site-Specific Ground Motion Procedures, Exception 2 being used.

Soil Cement Reactivity

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and CBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

Soil samples were obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentrations detected in these soil samples were less than 150 ppm (15 ppm) and are below the maximum allowable values established by HUD/FHA and CBC. However, it is recommended that Type II cement be used in formulation of concrete to compensate for sulfate reactivity with the cement.

Underground pipes and metal should be protected in accordance with manufacturer's recommendations. A corrosion engineer or specialist should be consulted for more specific recommendations.

Compacted Material Acceptance

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent on the stability of that material. The Soils Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with an in situ moisture content significantly less than optimum moisture. This type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

Testing and Inspection

A representative of Krazan & Associates, Inc., should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc., will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

LIMITATIONS

Soils Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using the most appropriate and most current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Soils Engineering, physical changes in the site, either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the soils report is completed may require the soils report to be professionally reviewed. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that 2 years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the Soils Engineer should be notified so that supplemental recommendations may be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

This report is a Geotechnical Engineering Investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands. Any statements, or absence of statements, in this report or on any boring log regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment.

The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 348-2200.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

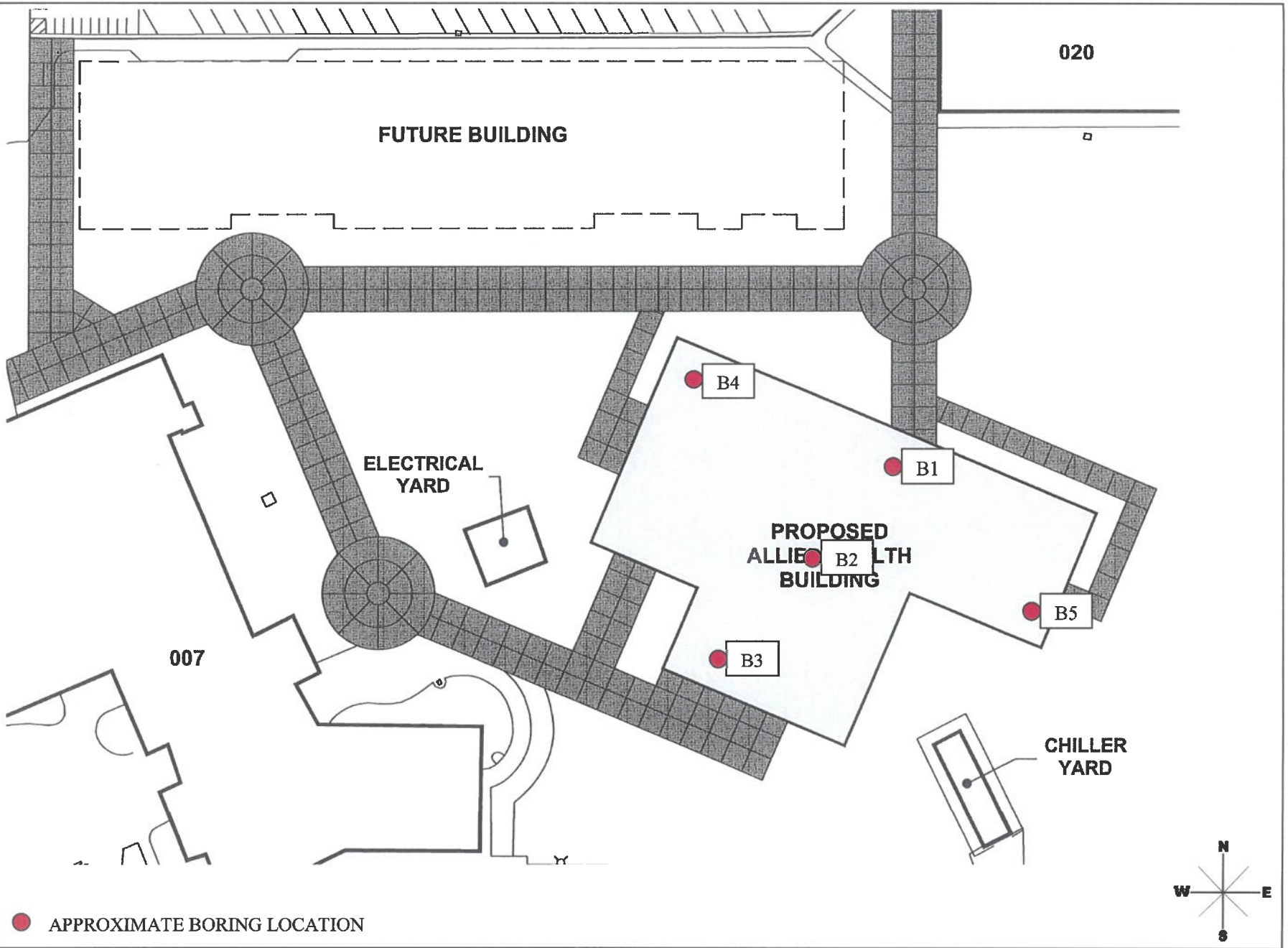


Stephen J. Nelson
Certified Engineering Geologist
CEG No. 2146



David R. Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

SJN/DRJ:ht



APPROXIMATE BORING LOCATION

SITE MAP	**Scale:** NTS	**Date:** January 2020	Krazan GEOTECHNICAL ENGINEERING
Allied Health Building **100 E. College Avenue** **Porterville, California**	**Drawn by:** HT	**Approved by:** DJ	
	Project No. 012-19207	**Figure No.** 1	

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Five 6½-inch exploratory borings were advanced. The boring locations are shown on the attached site plan.

The soils encountered were logged in the field during the exploration and with supplementary laboratory test data are described in accordance with the Unified Soil Classification System.

Modified standard penetration tests and standard penetration tests were performed at selected depths. These tests represent the resistance to driving a 2½-inch and 1½-inch diameter split barrel sampler, respectively. The driving energy was provided by a hammer weighing 140 pounds falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. The modified standard penetration tests are identified in the sample type on the boring logs with a full shaded in block. The standard penetration tests are identified in the sample type on the boring logs with half of the block shaded. All samples were returned to our Clovis laboratory for evaluation.

Laboratory Investigation

The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In-situ moisture content, dry density, consolidation, direct shear and sieve analysis tests were completed for the undisturbed samples representative of the subsurface material. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

The logs of the exploratory borings and laboratory determinations are presented in this Appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of 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 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

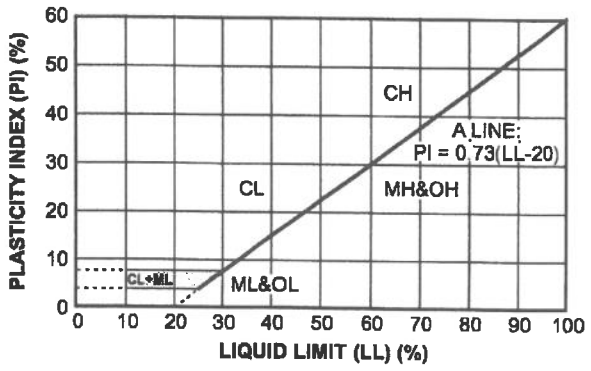
CONSISTENCY CLASSIFICATION

Description	Blows per Foot
Granular Soils	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
Cohesive Soils	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION

Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	12 to 13 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART



Log of Boring B1

Project: Allied Health Building

Project No: 012-19207

Client: Kern Community College District

Figure No.: A-1

Location: 100 E. College Avenue, Porterville, California

Logged By: Dave Adams

Depth to Water> **Initial:** 15 Feet **At Completion:** 15 Feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** FILL, fine- to medium-grained; brown, damp, drills easily				
2		***SILTY SAND (SM)*** Loose, fine- to coarse-grained; brown, damp, drills easily	91.6	2.4	■	15
6			104.1	2.8	■	12
10		***SILTY SAND/SAND (SM/SP)*** Medium dense, fine- to coarse-grained with trace GRAVEL; light brown, damp, drills easily	106.8	1.9	■	20
14		Saturated below 15 feet ▽			■	25
20						

Penetration Test blows/ft: 20, 40, 60

Water Content (%): 10, 20, 30, 40

Drill Method: Hollow Stem

Drill Date: 11-26-19

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 6½ Inches

Driller: Jim Watts

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B2

Project: Allied Health Building

Project No: 012-19207

Client: Kern Community College District

Figure No.: A-2

Location: 100 E. College Avenue, Porterville, California

Logged By: Dave Adams

Depth to Water> **Initial:** 15 Feet **At Completion:** 15 Feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
		SILTY SAND (SM) FILL, fine- to medium-grained; brown, damp, drills easily				
2		***SILTY SAND (SM)*** Loose, fine- to medium-grained; gray, damp, drills easily	94.0	2.2		9
4		Medium dense below 5 feet				
6			107.4	3.5		16
8		***SILTY SAND/SAND (SM/SP)*** Loose, fine- to coarse-grained with trace GRAVEL; light brown, moist, drills easily With trace COBBLES and drills hard below 9 feet				
10			104.6	3.3		12
12						
14		▽ Medium dense and saturated below 15 feet				
16			94.2	19.6		21
18						
20						

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Hollow Stem

Drill Date: 11-26-19

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 6½ Inches

Driller: Jim Watts

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B3

Project: Allied Health Building

Project No: 012-19207

Client: Kern Community College District

Figure No.: A-3

Location: 100 E. College Avenue, Porterville, California

Logged By: Dave Adams

Depth to Water> **Initial:** 15 Feet **At Completion:** 15 Feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	Penetration Test blows/ft (20 40 60)	Water Content (%) (10 20 30 40)
0		Ground Surface						
2		***SILTY SAND (SM)*** Very loose, fine- to medium-grained; brown, damp, drills easily Loose below 12 inches	99.1	4.0		14		
4								
6		***SILTY SAND (SM)*** Loose, fine- to coarse-grained; light brown, damp, drills easily	112.4	1.6		15		
8								
10		Medium dense with trace GRAVEL and COBBLES below 10 feet Drills hard below 11 feet		1.8		20		
12								
14		Saturated below 15 feet ▽						
16						17		
18								
20								

Drill Method: Hollow Stem

Drill Rig: CME 45C-4

Driller: Jim Watts

Krazan and Associates

Drill Date: 11-26-19

Hole Size: 6½ Inches

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B4

Project: Allied Health Building

Project No: 012-19207

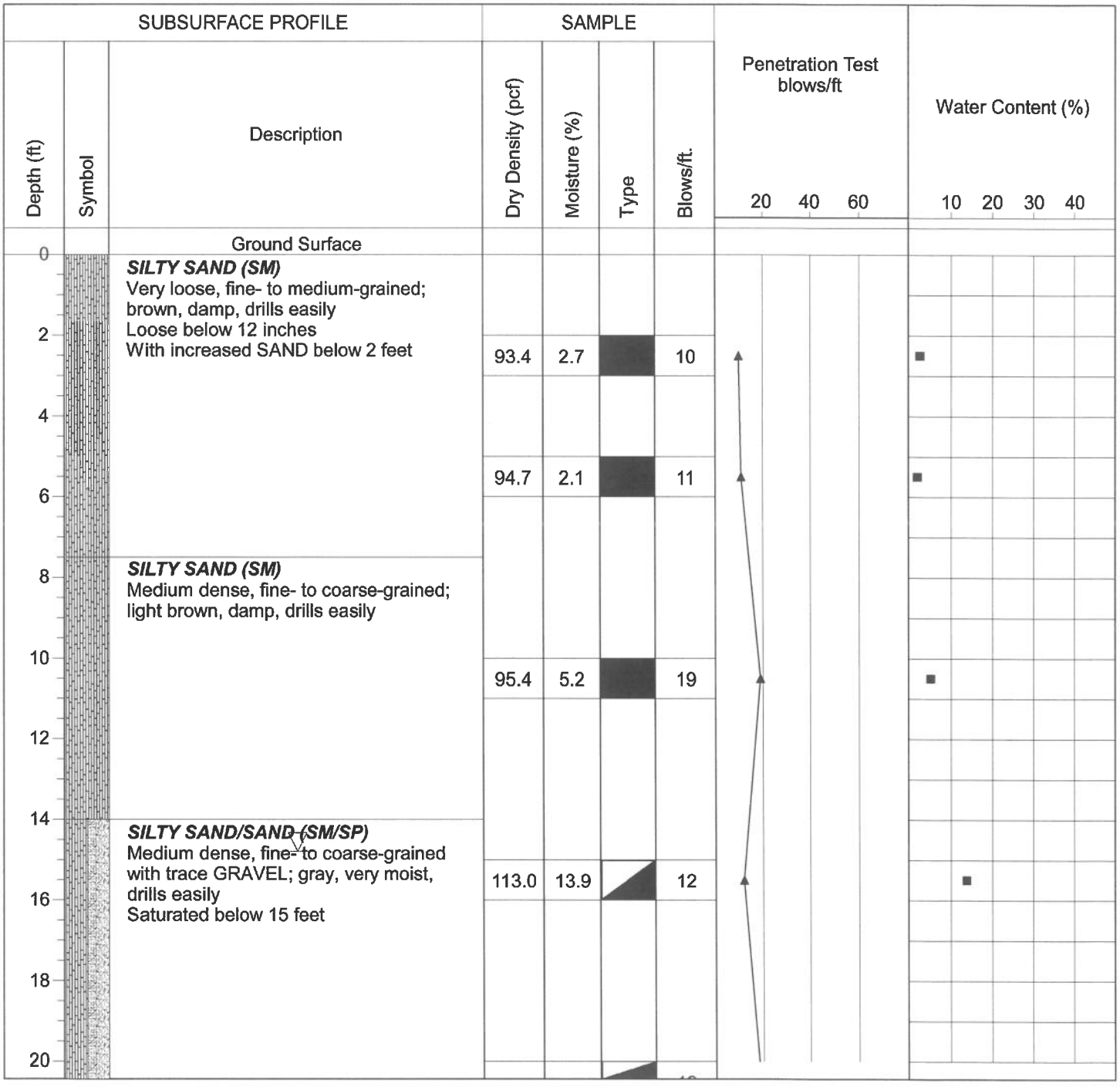
Client: Kern Community College District

Figure No.: A-4

Location: 100 E. College Avenue, Porterville, California

Logged By: Dave Adams

Depth to Water> **Initial:** 15 Feet **At Completion:** 15 Feet



Drill Method: Hollow Stem

Drill Date: 11-26-19

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 6½ Inches

Driller: Jim Watts

Elevation: 24 Feet

Log of Boring B4

Project: Allied Health Building

Project No: 012-19207

Client: Kern Community College District

Figure No.: A-4

Location: 100 E. College Avenue, Porterville, California

Logged By: Dave Adams

Depth to Water> **Initial:** 15 Feet **At Completion:** 15 Feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	Penetration Test blows/ft (20 40 60)	Water Content (%) (10 20 30 40)
		SANDY SILT (ML) Medium dense, fine- to medium-grained; brown, saturated, drills easily	109.2	15.2		19		■
22		***SILTY SAND/SAND (SM/SP)*** Very dense, fine- to coarse-grained with trace GRAVEL and COBBLES; brown, saturated, drills hard Auger refusal at 24 feet						
24		End of Borehole						
26								
28								
30								
32								
34								
36								
38								
40								

Drill Method: Hollow Stem

Drill Date: 11-26-19

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 6½ Inches

Driller: Jim Watts

Elevation: 24 Feet

Sheet: 2 of 2

Log of Boring B5

Project: Allied Health Building

Project No: 012-19207

Client: Kern Community College District

Figure No.: A-5

Location: 100 E. College Avenue, Porterville, California

Logged By: Dave Adams

Depth to Water> **Initial:** 15 Feet **At Completion:** 15 Feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0		***SILTY SAND (SM)*** FILL, fine- to medium-grained; brown, damp, drills easily				
2			99.0	2.1		20
4		***SILTY SAND (SM)*** Loose, fine- to medium-grained; brown, damp, drills easily				
6			88.3	1.9		12
8		***SILTY SAND/SAND (SM/SP)*** Medium dense, fine- to coarse-grained with trace GRAVEL; light brown, damp, drills firmly				
10			98.9	4.5		20
12		With trace COBBLES and drills hard below 11 feet				
14		▽ Loose and saturated below 15 feet				
16			99.0	13.3		9
18						
20						

Penetration Test blows/ft: 20, 40, 60

Water Content (%): 10, 20, 30, 40

Drill Method: Hollow Stem

Drill Date: 11-26-19

Drill Rig: CME 45C-4

Krazan and Associates

Hole Size: 6½ Inches

Driller: Jim Watts

Elevation: 24 Feet

Log of Boring B5

Project: Allied Health Building

Project No: 012-19207

Client: Kern Community College District

Figure No.: A-5

Location: 100 E. College Avenue, Porterville, California

Logged By: Dave Adams

Depth to Water> **Initial:** 15 Feet **At Completion:** 15 Feet

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	Penetration Test blows/ft (20 40 60)	Water Content (%) (10 20 30 40)
		SANDY SILT (ML) Loose, fine- to medium-grained; brown, saturated, drills easily		18.3		8		
22		***SILTY SAND/SAND (SM/SP)*** Very dense, fine- to coarse-grained with trace GRAVEL and COBBLES; brown, saturated, drills hard Auger refusal at 24 feet						
24		End of Borehole						
26								
28								
30								
32								
34								
36								
38								
40								

Drill Method: Hollow Stem

Drill Date: 11-26-19

Drill Rig: CME 45C-4

Krazan and Associates

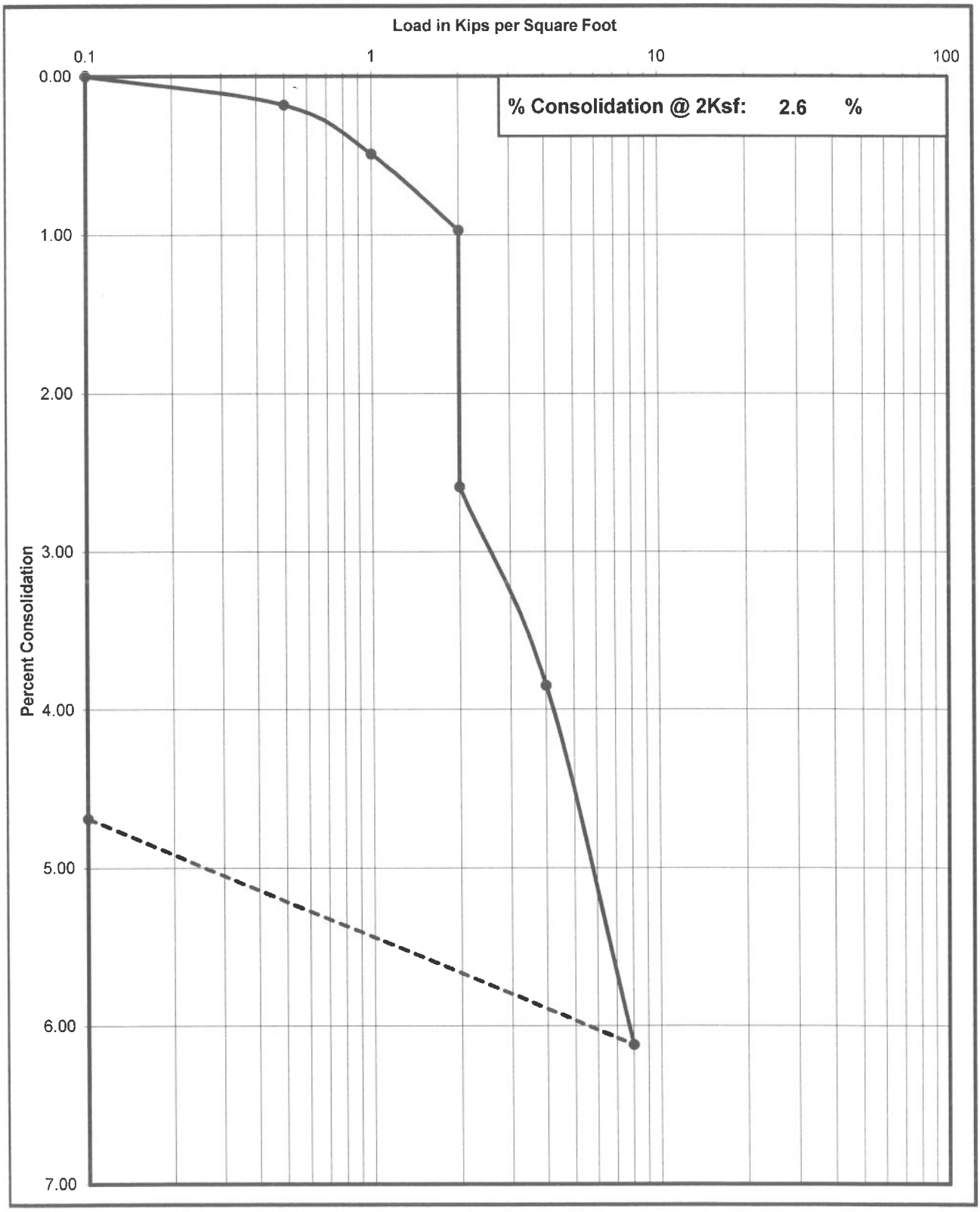
Hole Size: 6½ Inches

Driller: Jim Watts

Elevation: 24 Feet

Consolidation Test

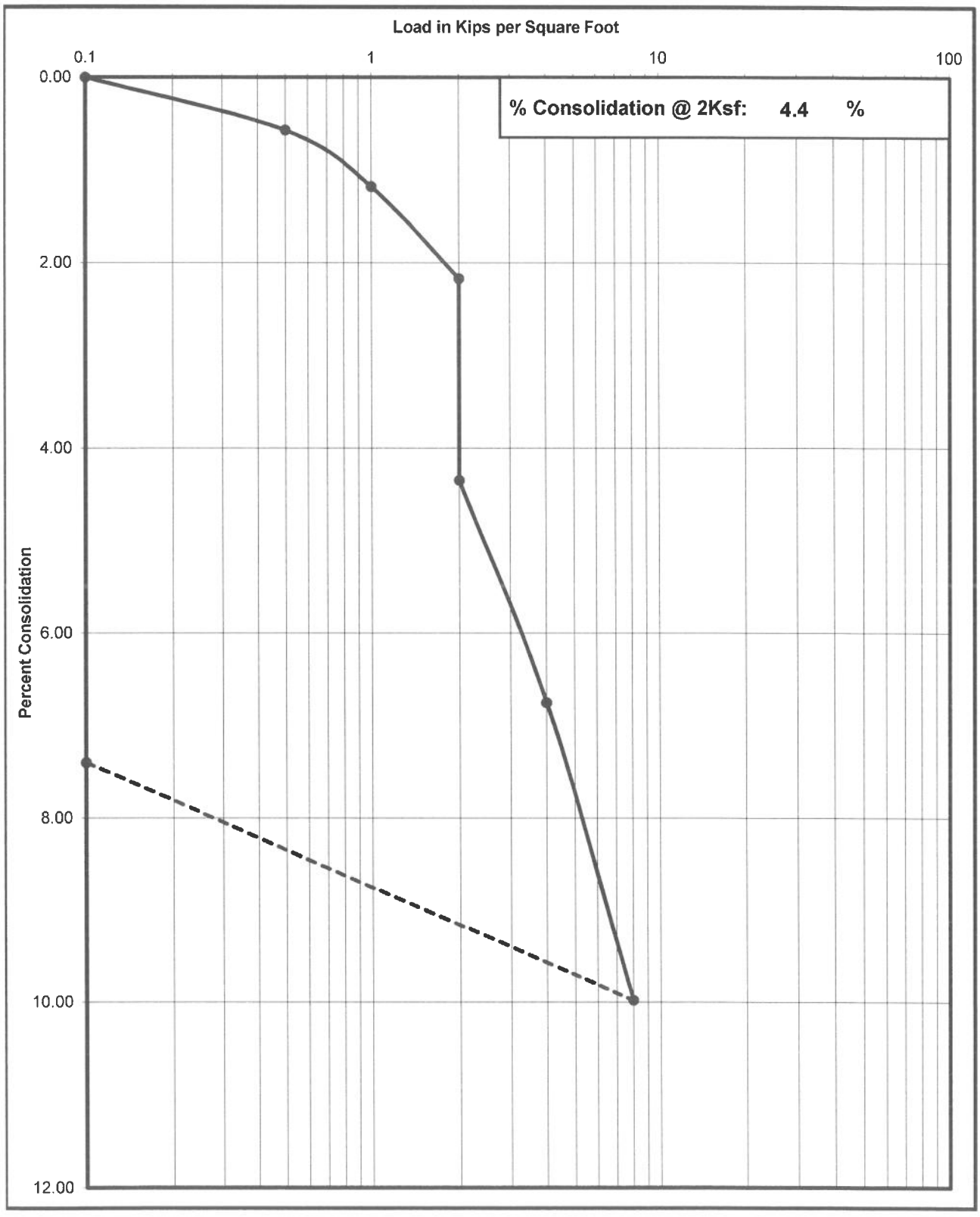
Project No	Boring No. & Depth	Date	Soil Classification
1219207	B2 @ 2-3'	12/2/2019	SM



Krazan Testing Laboratory

Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
1219207	B4 @ 2-3'	12/2/2019	SM

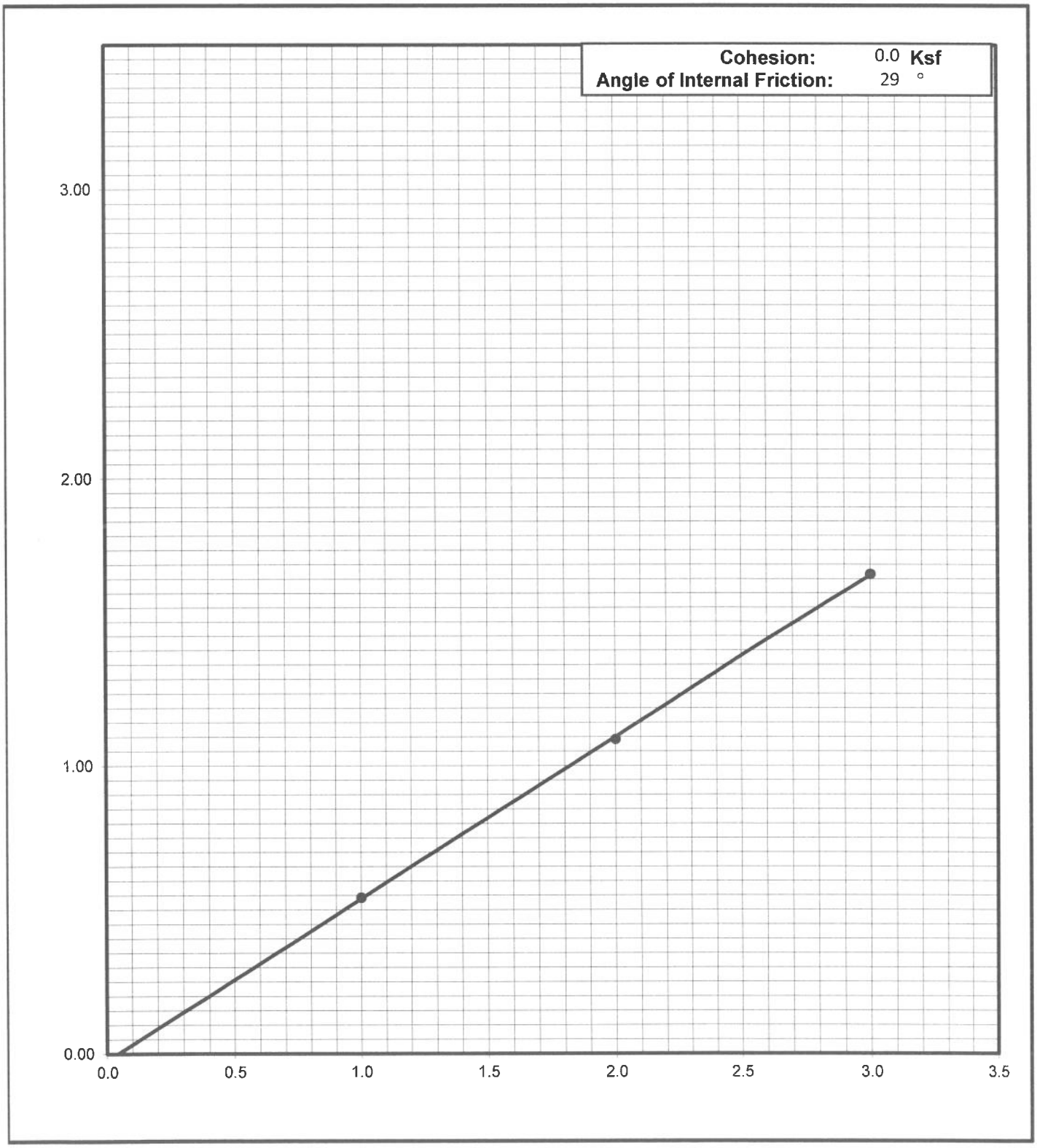


Krazan Testing Laboratory

Shear Strength Diagram (Direct Shear)

ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
1219207	B3 @ 2-3'	SM	--



Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	SM
Sample Number	B2 @ 2-3'

Krazan Testing Laboratory

Grain Size Analysis

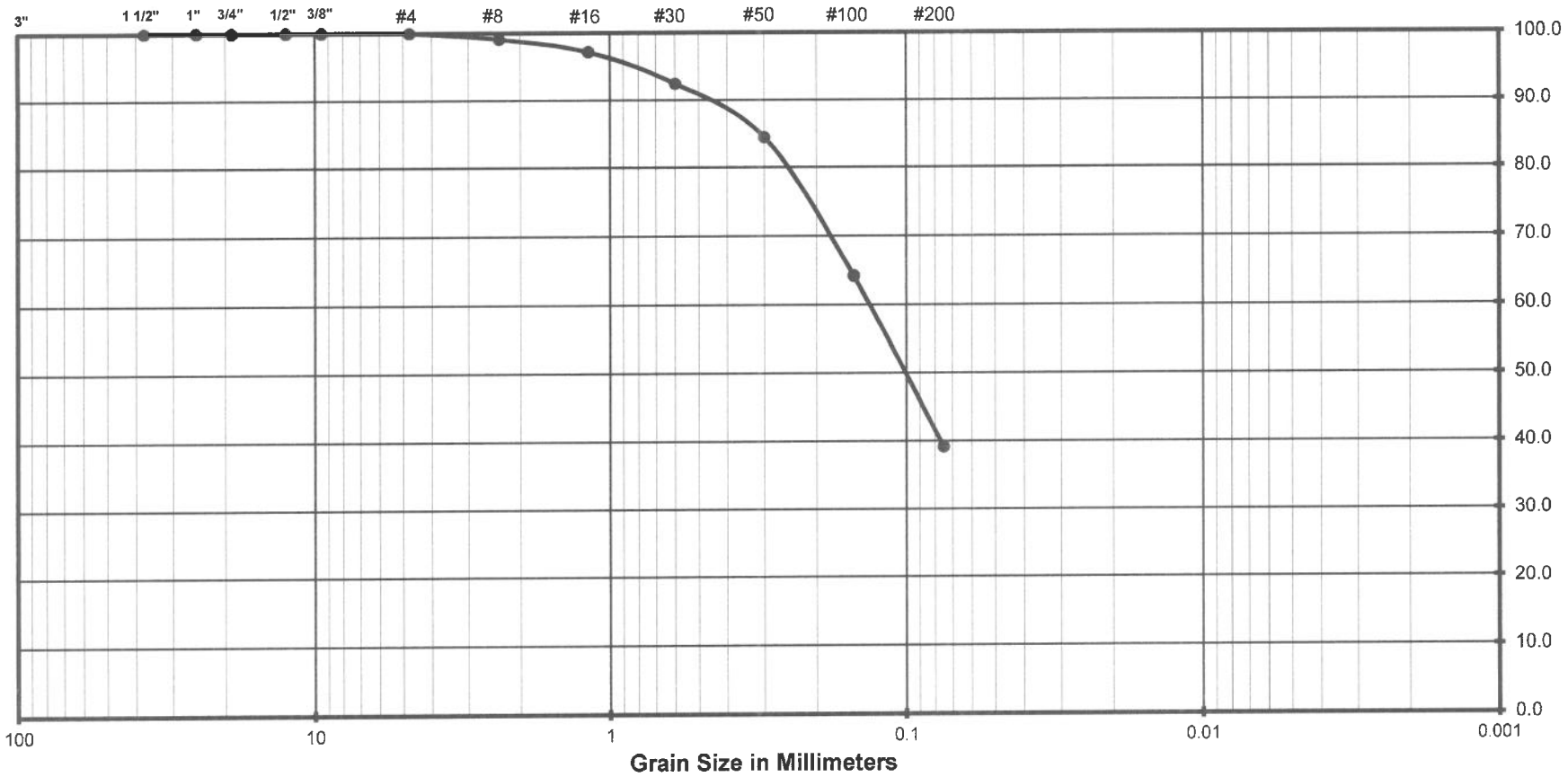


(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	SM
Sample Number	B4 @ 2-3'

Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	SM
Sample Number	B4 @ 5-6'

Krazan Testing Laboratory

Grain Size Analysis

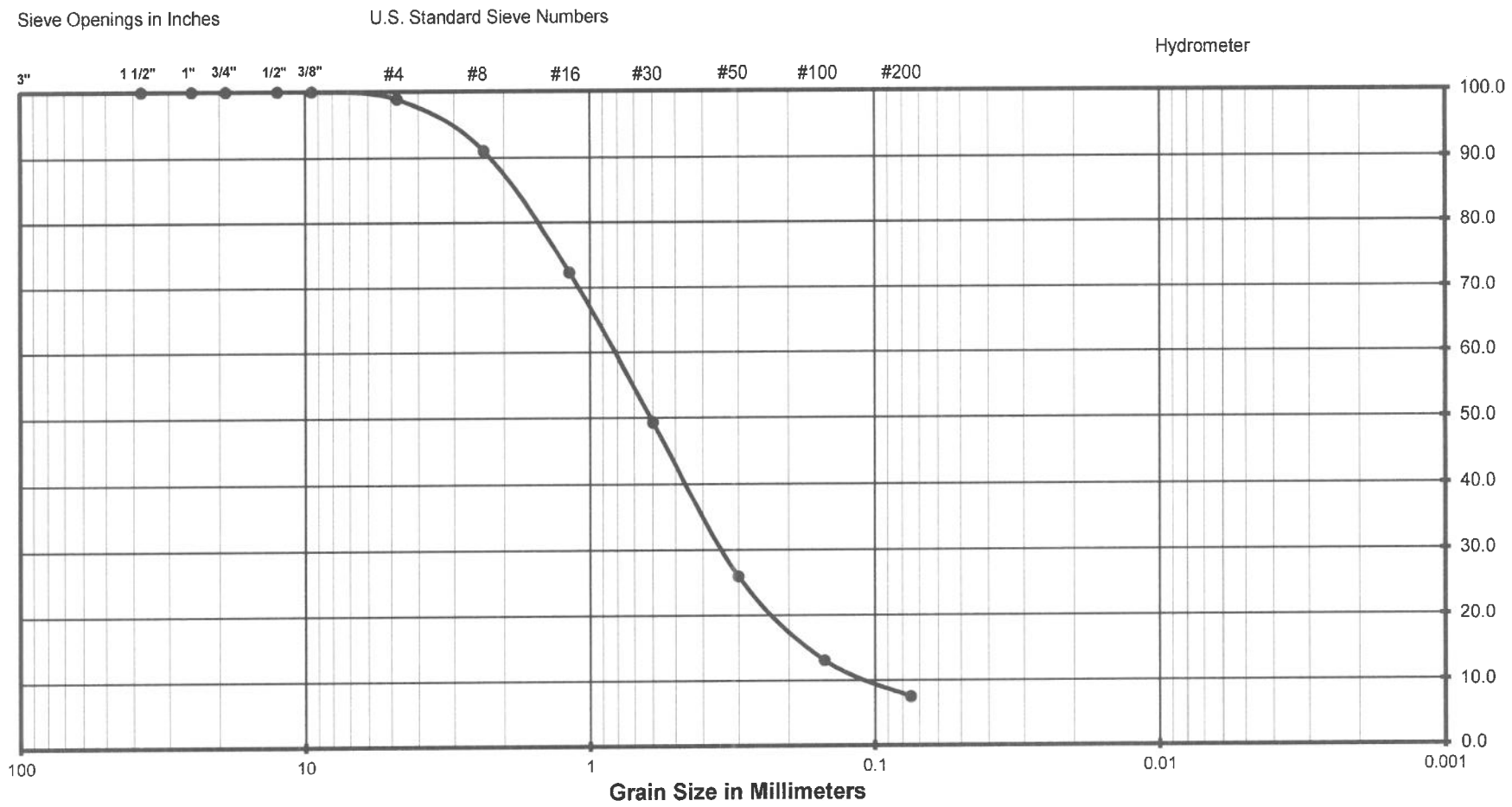


(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	SM
Sample Number	B4 @ 10-11'

Krazan Testing Laboratory

Grain Size Analysis

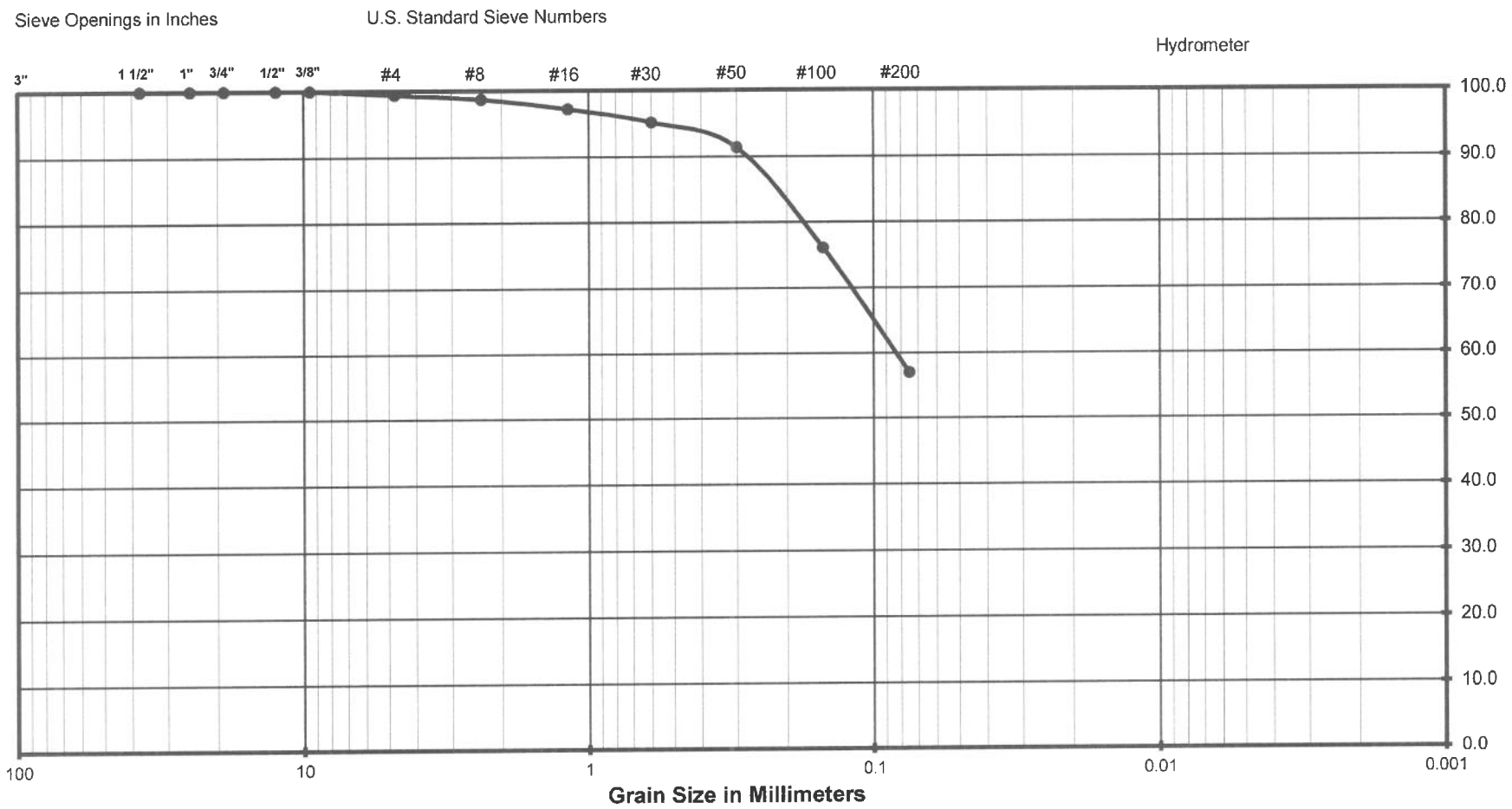


(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	SP/SM
Sample Number	B4 @ 15-16'

Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	ML
Sample Number	B4 @ 20-21'

Krazan Testing Laboratory

Grain Size Analysis

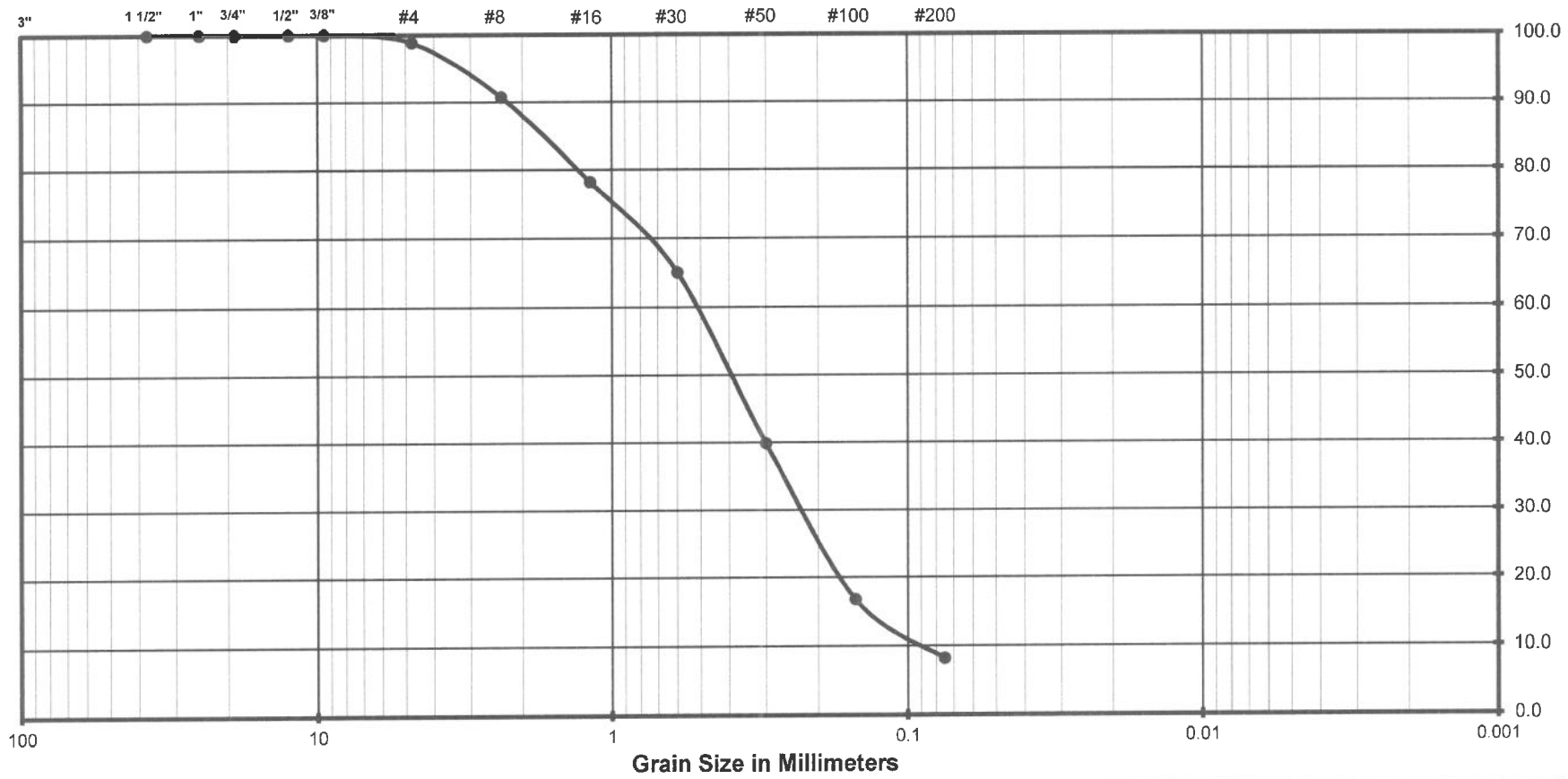


(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	SM
Sample Number	B5 @ 5-6'

Krazan Testing Laboratory

Grain Size Analysis



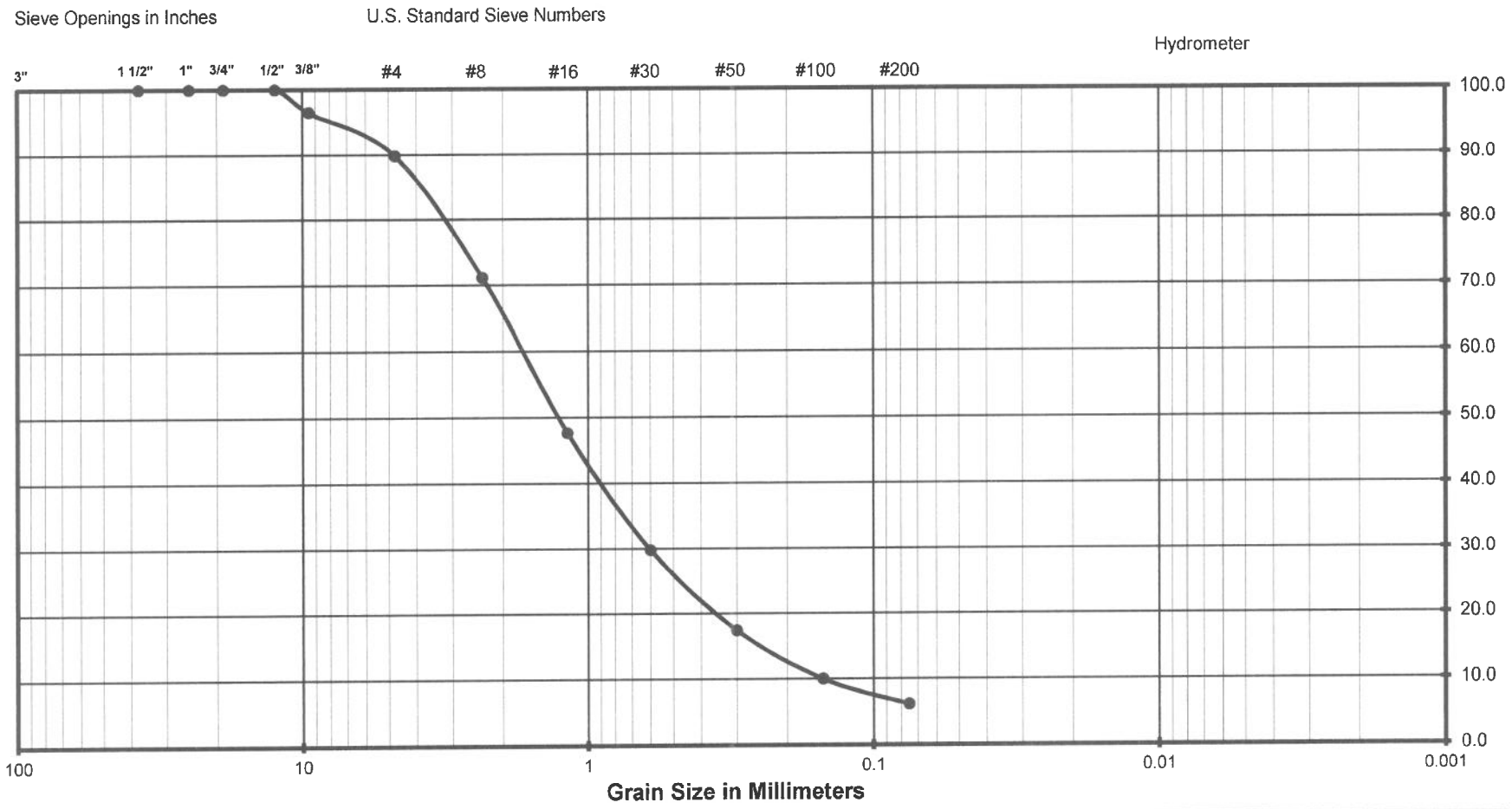
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	SM/SP
Sample Number	B5 @ 10-11'

Krazan Testing Laboratory

Grain Size Analysis



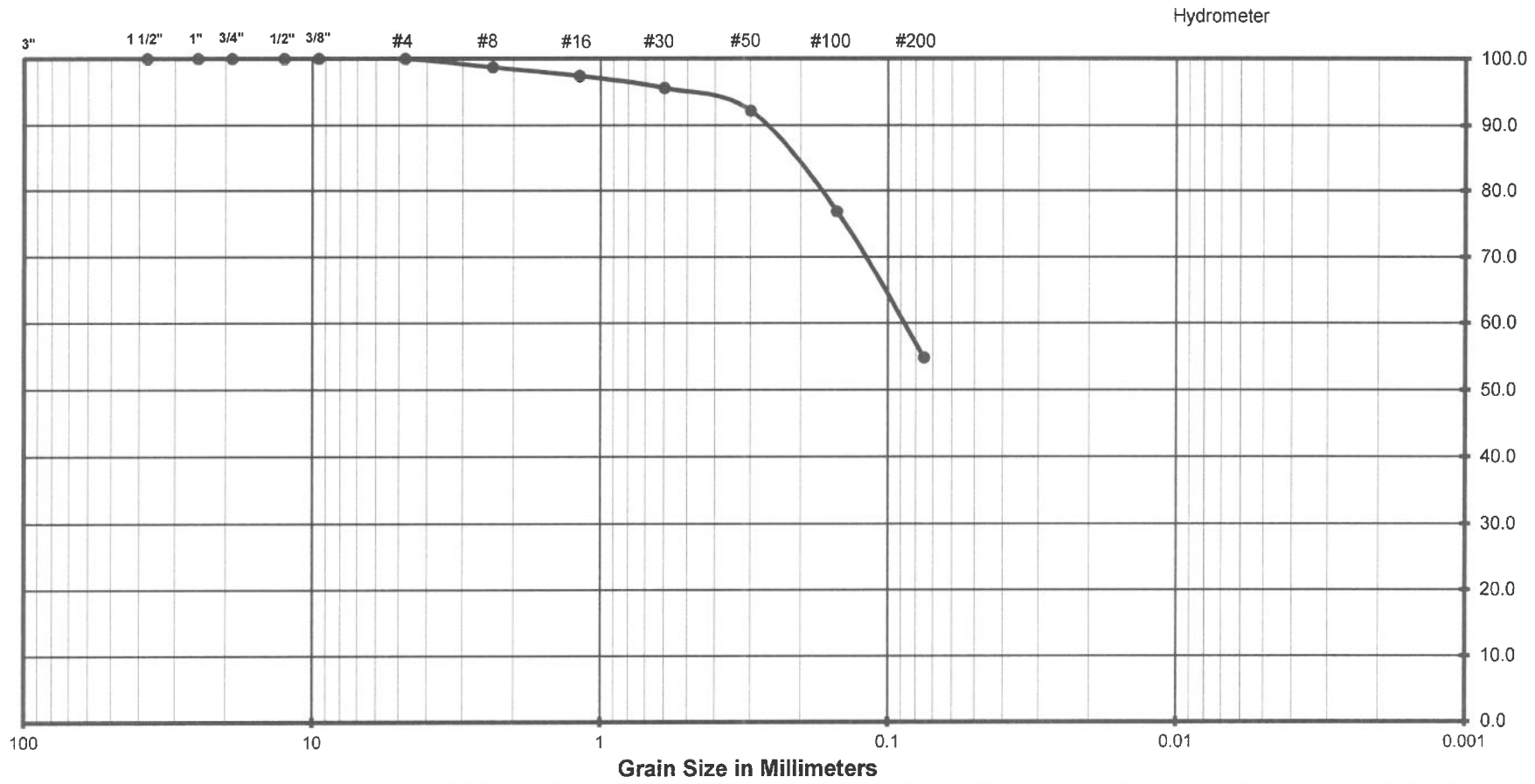
Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	SM/SP
Sample Number	B5 @ 15-16'

Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	Allied Health Building
Project Number	1219207
Soil Classification	ML
Sample Number	B5 @ 20-21'

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APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including but not limited to the furnishing of all labor, tools, and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans, and disposal of excess materials.

PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of Krazan and Associates, Inc., hereinafter known as the Soils Engineer and/or Testing Agency. Attainment of design grades when achieved shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density not less than 90 percent relative compaction based on ASTM Test Method D1557 or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the Contract documents for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or windblown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and the preparations of foundation materials for receiving fill.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter, and all other matter determined by the Soils Engineer to be deleterious or otherwise unsuitable. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots larger than 1 inch. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations should not be permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

SUBGRADE PREPARATION: Surfaces to receive Engineered Fill, building or slab loads shall be prepared as outlined above, excavated/scarified to a depth of 12 inches, moisture-conditioned as necessary, and compacted to 90 percent relative compaction.

Loose soil areas, areas of uncertified fill, and/or areas of disturbed soils shall be moisture-conditioned as necessary and recompacted to 90 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any of the fill material.

EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer.

Both cut and fill areas shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill are as specified.