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CONTRACTUAL REQUIREMENTS AND TECHNICAL SPECIFICATIONS

For

Landmark Square Senior Activity Center and Transit Center

CITY OF CLOVIS
1033 Fifth Street
Clovis, CA 93612

City of Clovis CIP 15-03
PHA PROJECT NO. 2016-39
Back Check Approval
August 12, 2020 Rev. 01

SECTION 00 01 07
SEALS PAGE

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END OF SECTION

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NOTICE INVITING BIDS

NOTICE IS HEREBY GIVEN that sealed bids will be received by the City Clerk of the City of Clovis ("City") for furnishing all labor, materials, services and equipment, and performing all work necessary as specified for, but not be limited to, construction of a senior activity center building, transit station building, and all utilities and surface improvements onsite and offsite related to the Landmark Square ("Project").

Pre-bid meetings will be held on Wednesday, October 14, 2020, at 10:00 a.m., at the existing Senior Center located at 850 Fourth Street, Clovis, CA 93612, and on Friday, October 16, 2020, at 3:00 p.m., on [Webex](#) and limited seating in the Council Chambers in the Clovis Civic Center located at 1033 Fifth Street, Clovis, CA 93612. **Attendance at one of the pre-bid meetings is mandatory.** Any bidder not attending one of the pre-bid meetings will be disqualified.

Bids will be received for the complete work in accordance with the plans and specifications on file with the City Clerk at the Clovis Civic Center, Clovis, CA. Plans and specifications, forms of proposal, contract and special provisions can be downloaded free of charge from the vendor portal of [PlanetBids, Inc.](#), which is accessible on the [City of Clovis website](#).

Bids must be filed with the City Clerk at the Clovis Civic Center **prior to 2:00 p.m., Tuesday, November 10, 2020**, at which time the City Clerk will open said bids. Bids shall be submitted in sealed envelopes and marked:

Bid Proposal: Landmark Square

No bid will be considered unless it is made on a bid proposal form furnished by the City Engineer. Each bid must be accompanied by a certified or cashier's check or bidder's bond on the City's form, made payable to the City of Clovis, for an amount equal to at least ten percent (10%) of the amount bid. Such guarantee will be forfeited should the bidder to whom the contract is awarded fail to enter into the contract. A Performance Bond in the amount equal to one hundred percent (100%) of the contract amount and a Labor and Materials (Payment) Bond in the amount equal to one hundred percent (100%) of the contract amount will be required by the City from the bidder to whom the contract is awarded. Said bonds shall be on the City's forms and shall be issued by a surety company which is an admitted surety insurer authorized by the California Department of Insurance to transact business in this state, which has a rating not lower than "A-" as rated by A.M. Best Company, Inc. or other independent rating companies, and which is acceptable to the City of Clovis. Bidders are cautioned that representations made by surety companies will be verified with the California Department of Insurance. In accordance with the provisions of Chapter 13 (commencing with Section 4590), Division 5, Title 1 of the Government Code of the State of California, securities may be substituted for monies withheld on the project.

In accordance with the provisions of Section 1770 of the Labor Code, the Director of the Department of Industrial Relations of the State of California has determined the General Prevailing Rates and wages and employer payments for health and welfare pension, vacation, travel time and subsistence pay, as provided for in Section 1773, apprenticeship or other training programs authorized by section 3093, and similar purposes applicable to the work to be done. Said wages are available from the Internet web site of the California Department of Industrial Relations at <http://www.dir.ca.gov/DLSR/PWD> and also available at the City Clerk Office, Clovis Civic Center, 1033 Fifth Street, Clovis, CA 93612. A copy of the above-mentioned wage rates shall be posted by the Contractor at the job site where it will be available to any interested party.

In accordance with the provisions of Sections 1725.5, 1771.1, 1771.3, and 1771.4 of the Labor Code, this project is subject to compliance monitoring and enforcement by the Department of Industrial Relations. 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 by that chapter of the Labor Code, unless currently registered and qualified to perform public work pursuant to Section 1725.5 of the Labor Code. See Section 7-2 of the General Provisions for additional requirements.

All bids are to be compared on the basis of the City Engineer's estimate of the quantities of work to be done as shown in the bid proposal form. The Contractor must be licensed in accordance with the provisions of the [Business and Professions Code](#), Division 3, Chapter 9 "Contractor." Bidders for this project must possess a valid **Class B License** prior to award of the contract and will be requested to indicate the licenses' expiration dates, and the license numbers on the bid proposal if available. Award consideration will take place at the earliest available Council meeting or as the City Manager has been authorized to award and execute the contract. All representations made on the proposal are made under penalty of perjury.

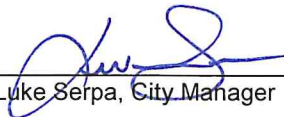
The lowest bid shall be determined by the amount of the base bid. The Owner reserves the right to add or deduct any of the additive or deductive items after the lowest responsible and responsive bidder is determined.

The City of Clovis reserves the right to reject any or all bids, to waive any informalities or minor irregularities in the bids received, or to award the contract to the lowest responsible bidder as may serve the best interest of the City of Clovis.

Time of completion for the Project shall be **three hundred sixty five (365)** calendar days from the date established in the Owner's Notice to Proceed.

Unless otherwise required by law, no bidder may withdraw its bid for a period of sixty (60) days after the date set for the opening thereof or any authorized postponement thereof. The Owner reserves the right to take more than sixty (60) days to make a decision regarding the rejection of bids or the award of the Contract.

CITY OF CLOVIS

By: 
Luke Serpa, City Manager

Date: OCTOBER 1, 2020

INSTRUCTIONS FOR BIDDERS

BIDS:

Bids to receive consideration shall be made in accordance with the following:

1. Bids shall be made on the form included in the bid package. Bids not made on the proper form shall be disregarded. Numbers must be stated in words and figures, and the signatures of all individuals must be in longhand. All information requested in the Bid Proposal shall be provided in full by the bidder.
2. No bid will be considered which makes exceptions, changes, or in any manner makes reservations to the terms of the drawings or specifications.
3. Questions regarding documents, discrepancies, omissions, or doubt as to meanings shall be referred immediately to the Owner who will send written instructions clarifying such questions to each bidder. Oral responses will not be binding on the Owner.
4. Each bid must give the full business address of the bidder and be signed by bidder with bidder's usual signature. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by a general partner with authority to bind the partnership in such matters, followed by the signature and designation of the person signing. The name of the person signing shall also be typed or printed below the signature. Bids by corporations must be signed with the legal name of the corporation, followed by the name of the state of incorporation and by the signature and designation of the chairman of the board, president or any vice president, and then followed by a second signature by the secretary, assistant secretary, the chief financial officer or assistant treasurer. All persons signing must be authorized to bind the corporation in the matter. The name of each person signing shall also be typed or printed below the signature. Satisfactory evidence of the authority of the officer signing on behalf of a corporation shall be furnished.
5. **REQUIRED DOCUMENTS:** All bids must be accompanied by a completed Noncollusion Declaration, Subcontractor Designation, Bid Bond (or other lawful security), Sufficient Funds Declaration (Labor Code § 2810), Workers' Compensation Certificate, Iran Contracting Act Certification, Drug Free Workplace Certification, and proof of registration of the contractor and subcontractors pursuant to Labor Code section 1725.5. Except for the proof of registration, the bidder shall use the City's forms for these submissions.
6. Bids shall be sealed when filed with the City prior to the bid opening. Irrespective of how a bidder chooses to deliver the bid and other documents to the Owner, the bidder is responsible for ensuring that the bid and other documents are actually received at the location designated in the Contract Documents for receipt of the bid and other documents prior to the time for the bid opening. Bids and other documents for any reason not actually received at the designated location prior to the time for the bid opening shall not be opened or considered.

PRE-BID MEETING:

Attendance at one of the pre-bid meetings is mandatory as detailed in the Notice Inviting Bids. The second pre-bid meeting will have the option of attending online via Webex per the date indicated in the notice inviting bids. If you wish to attend the webcast meeting held through Webex, click on the following hyperlink: [Webex meeting](#). If this documents hyperlink does not work you may join the meeting via Webex by logging on at www.webex.com, click join (towards the upper right corner), Meeting Information is 146 550 2502, Meeting Password is : Hu25rXNkDM6.

WITHDRAWAL OF BIDS:

Bids may be withdrawn by bidders prior to the time fixed for the submittal of bids or any authorized postponement thereof. A successful bidder shall not be relieved of the bid unless by consent of the Owner or bidder's recourse to Public Contract Code §5100 et seq.

OPENING OF BIDS:

Opening of bids shall be as soon after the time set as will be possible. Any and all bidders will be permitted to attend.

EXAMINATION OF CONTRACT DOCUMENTS AND SITE:

Before submitting a bid, bidders shall examine the drawings, read the specifications, the form of Agreement between Contractor and Owner, and all other Contract Documents. If a pre-bid walkthrough is held by the City, each bidder shall attend and examine the site of the proposed Work, including any buildings and any work that may have been done thereon. Bidders shall fully inform themselves of all conditions, in, at, and about the site, the building or buildings, if any, and any work that may have been done thereon.

Pursuant to Public Contract Code section 1104: (1) Bidders shall not be required to assume responsibility for the completeness and accuracy of architectural or engineering plans and specifications, except on clearly designated design build projects; (2) however, bidders shall be required to review architectural or engineering plans and specifications prior to submission of their bids and to report any errors and omissions to the Owner; and (3) the review shall be confined to the bidder's capacity as a bidder and not as a licensed design professional.

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

The form of the agreement between Owner and Contractor which the successful bidder will be required to execute, if awarded the Work, is a Contract Document and is part of this bid package.

ADDENDA OR BULLETINS:

Any addenda or bulletins issued prior to the bid opening shall form a part of the drawings, specifications, and Contract Documents, and shall be covered in the bid.

EVIDENCE OF RESPONSIBILITY:

Each bidder shall provide all evidence of the bidder's responsibility under Public Contract Code section 1103, as may be requested in the bid proposal form. In addition, upon the request of Owner after the bid opening, a bidder shall submit promptly to the Owner or its designee additional evidence of the bidder's responsibility under Public Contract Code section 1103. The Owner may consider such evidence before making its decision to award the proposed contract. Failure to submit evidence of the bidder's or its subcontractors' responsibility to perform the proposed contract, either as part of the bid or after the bid opening, may result in rejection of the bid.

AWARD OF CONTRACT:

Rejection of any or all bids, to contract work with whomever and in whatever manner, to abandon work entirely, and/or to waive any informality in receiving of bids is reserved as the right of the Owner.

The Contract shall be awarded to the lowest responsible and responsive bidder as interpreted by the Owner under California law and as specified herein and shall be entered into by the successful bidder within ten (10) days after mailing, faxing or delivery of the Notice of Award of Contract. Owner reserves the right, without any liability, to cancel the award of any bid for any reason at any time before the full execution of the Agreement between Owner and Contractor.

EXECUTION OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

The Agreement between Owner and Contractor shall be signed by the successful bidder in as many originals as the Owner deems necessary and returned, together with the required performance and payment bonds (which must use the attached forms), insurance certificates, additional insured endorsement, and declarations page within ten (10) days after the mailing, faxing or delivering of the Notice of Award of Contract. If the ten (10) day period would expire after the date for commencement of the Work, Contractor must submit the documents before the date of commencement of the Work. If the successful bidder does not comply with this paragraph, Owner may revoke and/or cancel the award to the successful bidder and award the Contract to the next lowest bidder, or may otherwise proceed as allowed by law.

SUBSTITUTION OF MATERIALS:

The Contractor must ensure that any proposed substitutions by the Contractor or its subcontractors, seeking possible approval of any equipment or materials thought to be equal to or better than those specified in the drawings or specifications, are submitted to the Owner a minimum of seven (7) business days prior to the bid opening to allow time for review. If approved, Owner will issue an addendum at least seventy (72) hours prior to bid opening, including all equipment and materials deemed equivalent to those specified and approved (see Specification §96-06). Submittals shall include comparative data of the specified equipment or material and the proposed substitution as set forth in the Contract Documents. Submittals without this information will be automatically rejected.

TAXES:

The Owner is generally exempt from payment of Federal Excise Tax on materials. The Owner will furnish exemption certificates to the Contractor to be used to obtain materials ordinarily subject to Federal Excise Tax without payment of the tax. Bidder shall execute a change order to reduce the contract price by the amount of any and all cost savings received by Contractor by virtue of the exemption certificates.

SECURITIES IN LIEU OF RETENTION; ESCROW ACCOUNT:

Contractor may substitute securities in lieu of retention, as provided by Public Contract Code section 22300. If Contractor requests the Owner to deposit retention in an escrow account at a bank, the parties shall enter an escrow agreement as provided in Public Contract Code section 22300.

BID PROTEST PROCEDURES:

All bid protests must comply with the following, or they shall be rejected as invalid:

1. The protest shall be in writing;
2. The protest shall be filed and received no later than 4:00 p.m. on the third (3rd) business day after the deadline for submittal of the bids;
3. The protest shall set forth in detail all grounds for the protest, including all facts, supporting documentation, legal authorities and arguments in support of the bid protest;
4. Before the bid protest deadline, the protesting party shall transmit the complete bid protest, including all documentation, to all other parties having a potential interest that may be adversely affected by the outcome of the protest, including but not limited to all other bidders who may have a reasonable prospect of losing or obtaining an award of the Contract depending on the outcome of the protest; and
5. All factual contentions must be supported by competent, admissible and credible evidence.

The procedures and time limits set forth in this section for bid protests are strictly construed and are protesting party's sole and exclusive remedy in the event of a bid protest. Protesting party's failure to strictly comply with these procedures and time limits shall constitute a waiver of any right to further pursue the bid protest, including but not limited to the presentation of a Government Code claim or legal proceedings. Any matter not set forth in the protest, including any ground for the protest or any evidence supporting a ground for the protest, shall be deemed waived.

A protesting party may not rely on the bid protest submitted by another protesting party, but must timely pursue its own bid protest.

Owner shall review a bid protest that was not rejected for failing to comply with the above procedures. Any final decision on such a bid protest shall be made by the City Council.

BID PROPOSAL**FOR
Landmark Square**

TO: The City Manager
City of Clovis
Clovis, CA 93612

FROM: CONTRACTOR

Name of bidder

Note: bidders are required to write the unit price in both words and figures for each bid item.

BASE BID ITEMS

The undersigned bidder, having carefully examined the location of the Work, the Plans and Specifications, and all other Contract Documents for the Landmark Square contract, hereby proposes to furnish, in strict accordance with the Contract Documents, all of the materials, labor, equipment, applicable taxes, and services necessary for the completion of this project and assume all liability imposed upon the Contractor by the Contract, and to accept as full compensation the bid item prices set forth in the following:

- ITEM NO. 1: **Senior Activity Center** – All work within five feet of building perimeter and finish grading for the sum of _____ Dollars (\$_____).
- ITEM NO. 2: **Transit Center** – All work within five feet of building perimeter and finish grading for the sum of _____ Dollars (\$_____).
- ITEM NO. 3: **Shade Structure** – Building structure and footings, informational signage and lighting for the sum of _____ Dollars (\$_____).
- ITEM NO. 4: **On & Off Site Work** – All off site and on site work up to five feet of building perimeters including rough grading of building pads for the sum of _____ Dollars (\$_____).

These amounts include all allowances and contingency funds identified in the Agreement form or other documents in the bid package

ALTERNATE BID ITEMS

In addition to the above base bid items, the undersigned bidder proposes and agrees to perform the Contract with the following alternate scope(s) of work for the listed price adjustment(s):

ALTERNATE ITEM NO. 1: Deductive alternate to eliminate finishes in Room 108 Fitness Room of the Senior Activity Center per Section 012300 of Division 01 of the project specifications
for the sum of _____ Dollars (\$_____).

ALTERNATE ITEM NO. 2: Deductive alternate to eliminate the Emergency Generator per Section 012300 of Division 01 of the project specifications
for the sum of _____ Dollars (\$_____).

ALTERNATE ITEM NO. 3: Deductive alternate to eliminate all metal roofing per Section 012300 of Division 01 of the project specifications
for the sum of _____ Dollars (\$_____).

ALTERNATE ITEM NO. 4: Deductive alternate to eliminate wainscot in Halls 127, 137 of the Senior Activity Center per Section 012300 of Division 01 of the project specifications
for the sum of _____ Dollars (\$_____).

ALTERNATE ITEM NO. 5: Deductive alternate to use alternate building siding for both buildings per Section 012300 of Division 01 of the project specifications
for the sum of _____ Dollars (\$_____).

ALTERNATE ITEM NO. 6: Deductive alternate to eliminate roof overhang at the multipurpose of the Senior Activity Center per Section 012300 of Division 01 of the project specifications
for the sum of _____ Dollars (\$_____).

ALTERNATE ITEM NO. 7: Deductive alternate to eliminate interior storefront windows and doors for both buildings per Section 012300 of Division 01 of the project specifications
for the sum of _____ Dollars (\$_____).

ALTERNATE ITEM NO. 8: Deductive alternate to modify exterior storefront windows and doors for both buildings per Section 012300 of Division 01 of the project specifications
for the sum of _____ Dollars (\$_____).

ALTERNATE ITEM NO. 9: Deductive alternate to eliminate wood ceiling panel system of the Senior Activity Center per Section 012300 of Division 01 of the project specifications
for the sum of _____ Dollars (\$_____).

BIDDER QUALIFICATIONS QUESTIONNAIRE

INSTRUCTIONS: Bidder must answer all questions and provide all information requested on additional pages, all of which must be submitted with the Bid Proposal by the bid opening deadline.

A. GENERAL REQUIREMENTS FOR QUALIFICATION

1. At the time of submitting this form, is your firm ineligible to bid on or be awarded a public works contract, or perform as a subcontractor on a public works contract, pursuant to either Labor Code section 1777.1 or Labor Code section 1777.7?

☐ Yes ☐ No

If the answer is "Yes," state the beginning and ending dates of the period of debarment.

2. Was your firm in bankruptcy at any time during the last five years?

☐ Yes ☐ No

If "yes," please attach a copy of the bankruptcy petition, showing the case number and the date on which the petition was filed, and a copy of the Bankruptcy Court's discharge order, or of any other document that ended the case, if no discharge order was issued.

B. Licenses

1. Has any contractor's license held by your firm, or its responsible managing employee ("RME") or responsible managing officer ("RMO") been suspended or revoked at any time in the last five years?

☐ Yes ☐ No

If "yes," please explain on a separate signed sheet.

C. Disputes

1. At any time in the last five years has your firm been assessed and paid liquidated damages after completion of a project under a construction contract with either a public or private owner?

☐ Yes ☐ No

If yes, explain on a separate signed page, identifying all such projects by owner, owner's address, the date of completion of the project, amount of liquidated damages assessed and all other information necessary to fully explain the assessment of liquidated damages.

2. In the last five years has your firm, or any firm with which any of your company's owners, officers or partners was associated, been debarred, disqualified, removed or otherwise prevented from bidding on, or completing, any government agency or public works project for any reason?

☐ Yes ☐ No

If "yes," explain on a separate signed page. State whether the firm involved was the firm applying for prequalification here or another firm. Identify by name of the company, the name of the person within your firm who was associated with that company, the year of the event, the owner of the project, the project and the basis for the action.

3. In the last five years has your firm been denied an award of a public works contract based on a finding by a public agency that your company was not a responsible bidder?

☐ Yes ☐ No

If "yes," explain on a separate signed page. Identify the year of the event, the owner, the project and the basis for the finding by the public agency.

4. In the past five years has any claim of \$50,000 or more against your firm concerning your firm's work on a construction project been filed by a project owner in court or arbitration?

☐ Yes ☐ No

If "yes," on separate signed sheets of paper identify the claim(s) by providing the project name, date of the claim, name of the claimant, a brief description of the nature of the claim, the court in which the case was filed and a brief description of the status of the claim (pending or, if resolved, a brief description of the resolution).

5. Excluding "pass-through" claims originated by subcontractors or suppliers of yours, in the past five years has your firm made any claim of \$50,000 or more against a project owner concerning work on a project or payment for a contract and filed that claim in court or arbitration?

☐ Yes ☐ No

If "yes," on separate signed sheets of paper identify the claim by providing the project name, date of the claim, name of the entity (or entities) against whom the claim was filed, a brief description of the nature of the claim, the court in which the case was filed and a brief description of the status of the claim (pending, or if resolved, a brief description of the resolution).

6. Has your firm had a contract for a public work of improvement in the last five years that was terminated by the project owner (except a termination for convenience)?

☐ Yes ☐ No

If the answer is "Yes," for each such contract attach a separate sheet identifying the owner, your bonding company, the original contract value, the value of the work terminated and a brief explanation of the circumstances leading to the termination.

7. Has your firm ever entered into a settlement agreement, or otherwise agreed, with a public entity that your firm would not bid on future projects advertised by the public entity for a specified period of time?

☐ Yes ☐ No

If the answer is "Yes," for each such agreement attach a separate sheet identifying the public entity and the period of time during which your firm agreed not to bid.

8. At any time during the past five years, has any surety company made any payments on your firm's behalf as a result of a default, to satisfy any claims made against a performance or payment bond issued on your firm's behalf, in connection with a construction project, either public or private?

☐ Yes ☐ No

If "yes," explain on a separate signed page the amount of each such claim, the name and telephone number of the claimant, the date of the claim, the grounds for the claim, the present status of the claim, the date of resolution of such claim if resolved, the method by which such was resolved if resolved, the nature of the resolution and the amount, if any, at which the claim was resolved.

9. Has any stop payment notice in the last five (5) years resulted in a claim against your payment bond?

☐ Yes ☐ No

If "yes," explain on a separate signed page.

D. Criminal Matters and Related Civil Suits

1. Has your firm or any of its owners, officers or partners ever been found liable in a civil suit or found guilty in a criminal action for making any false claim or material misrepresentation to any public agency or entity?

☐ Yes ☐ No

If "yes," explain on a separate signed page, including identifying who was involved, the name of the public agency, the date of the investigation and the grounds for the finding.

2. Has your firm or any of its owners, officers or partners ever been convicted of a crime involving any federal, state, or local law related to construction?

☐ Yes ☐ No

If "yes," explain on a separate signed page, including identifying who was involved, the name of the public agency, the date of the conviction and the grounds for the conviction.

E. Bonding

1. Has a surety firm completed a contract on your behalf, or paid for completion because your firm was default terminated by the project owner within the last five (5) years?

☐ Yes ☐ No

BID SUMMARY

Total amount of Base Bid is _____
_____ dollars and _____ cents
(\$_____).

ALL BID PRICES IN THE BASE BID SECTION SHALL BE DETERMINED BASED ON THE UNIT PRICE, IF APPLICABLE. IN CASE OF DISCREPANCY BETWEEN THE UNIT PRICE IN WORDS AND FIGURES, THE UNIT PRICE QUOTED IN WORDS SHALL PREVAIL.

The city reserves the right to waive any informalities or minor irregularities in the bids. In case the unit price in words is incorrectly written as the bid price for a quantity based item, and the price in words matches exactly the numerical bid price, it will be considered that the unit price in figures is given in good faith. Only in such cases, the unit price in figures will be used.

CONTRACTOR SHALL BID ON ALL OF THE ITEMS IN THE BASE BID SECTION AND, IF APPLICABLE, THE ALTERNATE BID SECTION. THE OWNER RESERVES THE RIGHT TO REJECT ANY OR ALL BIDS.

The low bid shall be determined as described in the Notice to Bidders.

If written notice of the Award of Contract is mailed, faxed, or delivered to the undersigned at any time before this bid is withdrawn, the undersigned shall, within ten (10) days after the date of such mailing, faxing, or delivering of such notice, execute and deliver an agreement in the form of agreement present in these Contract Documents and give Performance and Payment Bonds in accordance with the specifications and bid as accepted.

The undersigned hereby designates as the office to which such Notice of Award of Contract may be mailed, faxed, or delivered:

Our Public Liability and Property Damage Insurance is placed with:

Our Workers' Compensation Insurance is placed with:

Circular letters, bulletins, addenda, etc., bound with the specifications or issued during the time of bidding are included in the bid, and, in Completing the Contract, they are to become a part thereof.

This bid may be withdrawn at any time prior to the scheduled time for the opening of bids or any authorized postponement thereof.

A bidder shall not submit a bid unless the bidder's California contractor's license number appears clearly on the bid, the license expiration date and class are stated, and the bid contains a statement that the representations made therein are made under penalty of perjury. Any bid submitted by a contractor who is not licensed pursuant to Business and Professions Code section 7028.15 shall be considered

nonresponsive and shall be rejected. Any bid not containing the above information may be considered nonresponsive and may be rejected.

ADDENDA - This proposal is submitted with respect to the changes to the contract included in addendum number/s

_____.

WARNING: If an addendum or addenda have been issued by the administering agency and not noted above as being received by the bidder, this proposal may be rejected.

The undersigned has carefully checked all of the above figures and understands that the City shall not be responsible for any errors or omissions on the part of the undersigned in making up this bid.

A certified or cashier's check made payable to the City, or a bid bond in favor of said City on the City's form, for

_____ (\$ _____),

which amount is not less than ten percent (10%) of the total amount of this proposal, is attached hereto and is given as a guarantee that the undersigned will execute an agreement and furnish the required bonds if awarded the contract and in case of failure to do so within ten days from notice of award the same will be forfeited to the City.

BIDDER'S INFORMATION AND SIGNATURE

The undersigned certifies that he has a valid license as Contractor in the State of California, for the classes required on this Project (Class _____), the numbers of which are _____ and the expiration dates of which are _____. The authorized person signing below affirms that the information, answers, and representations in this bid are true, correct, and complete, and he/she acknowledges and understands that they are made under penalty of perjury under the laws of the State of California.

1. Bidding Firm	2. Type of Business <input type="checkbox"/> Corporation <input type="checkbox"/> Jt. Venture <input type="checkbox"/> Partnership <input type="checkbox"/> Individual DBA _____
3. Business Address	4. Telephone Number ()
City _____ State _____ Zip Code _____	5. Fax Number ()
6. E-mail Address	8. Signature of Authorized Person
7. Name of Authorized Person	

PLEASE SEE THE FOLLOWING INSTRUCTIONS REGARDING SIGNATURE:

- 1) If bidder is an individual, enter name here in style used in business; if a joint venture, exact names of entities joining in the venture; if a partnership, the correct trade style of the partnership; if a corporation, the exact name of the corporation under which it is incorporated.
- 2) If bidder is other than an individual, identify here its character, i.e. corporation (including state of corporation), joint venture, partnership, etc. If bidder is an individual operating under a trade name, state "Individual DBA (trade name in full)".
- 3) State on this line the address to which all communications and notices regarding the Bid Proposal and any contract awarded thereunder, are to be addressed.
- 4) State on this line the phone numbers to which all general communications will be directed.
- 5) State on this line the fax numbers to which all general communications will be directed.
- 6) State on this line the E-mail address to which all electronic communications and notices are to be addressed.
- 7) If bidder is a joint venture, signature must be by one of the joint ventures, and if one or both of the joint ventures is a partnership or a corporation each participating partnership must sign by a general partner, and each corporation by an authorized officer or employee; if a partnership, by a general partner; if a corporation, by an authorized officer or employee. The title of the person signing must appear after his signature. Where bidder is a partnership or a corporation, the names of all other general partners, or the names of the president and secretary of the corporation and their business addresses must be shown below:

NOTE: All signatures must be signed and printed or typewritten above. All addresses must be complete with street number, city and state information.

[END OF BID PROPOSAL FORM]

SUBCONTRACTOR DESIGNATION

Pursuant to the provisions of Sections 4100 to 4113, inclusive, of the Public Contract Code of the State of California, the Bidder hereby designates below, for the project, opposite various portions of work, the names and locations of the places of business of each subcontractor who will perform work or labor in an amount in excess of one-half of one percent (1/2 of 1%) of the amount of the total bid. All work not listed below shall be performed by the undersigned bidder. It is understood that the bidder, if awarded the contract, shall not substitute any subcontractor in place of the subcontractors herein designated subcontractor, or sublet or subcontract any of the work as to which a subcontractor is not herein designated without the consent of the City and approval of the Engineer. The bidder may submit a correct subcontractor license number within 24 hours after the bid opening if the corrected number corresponds to the submitted name and location of that subcontractor. If so corrected, an inadvertent error in listing the subcontractor's license number shall not be grounds for filing a bid protest or for considering the bid nonresponsive. The subletting or subcontracting of any work for which there was no subcontractor designated in the original bid may be permitted only in case of public emergency or necessity. The Contractor shall perform, with its own organization, no less than five (5) percent of the original total contract price, except for all federal-aid projects, which is thirty percent (30%) minimum, as defined in the Caltrans' [Local Assistance Procedures Manual](#) Chapter 16 Subsection 16.6 "Subcontractors".

NOTE: List one firm only for each portion of work. All sub-contractors' names, license numbers, and portions of work must be clearly printed or typewritten below, except street address, city, state, and zip code information may be provided within 24 hours of the opening of bids.

SUBCONTRACTOR 1

Portion of Work (describe portion, and state percentage of total contract price)

()

Company Name

Phone

California Contractor License Number

DIR Registration #

Address

City

State

Zip-code

SUBCONTRACTOR 2

Portion of Work (describe portion, and state percentage of total contract price)

()

Company Name

Phone

California Contractor License Number

DIR Registration #

Address

City

State

Zip-code

SUBCONTRACTOR DESIGNATION (CONT.)

NOTE: Use additional pages if necessary. List one firm only for each portion of work. All sub-contractors' names, license numbers, and portions of work must be clearly printed or typewritten below, except street address, city, state, and zip code information may be provided within 24 hours of the opening of bids.

SUBCONTRACTOR 3

Portion of Work (describe portion, and state percentage of total contract price)

()

Company Name

Phone

California Contractor License Number

DIR Registration #

Address

City

State

Zip-code**SUBCONTRACTOR 4**

Portion of Work (describe portion, and state percentage of total contract price)

()

Company Name

Phone

California Contractor License Number

DIR Registration #

Address

City

State

Zip-code**SUBCONTRACTOR 5**

Portion of Work (describe portion, and state percentage of total contract price)

()

Company Name

Phone

California Contractor License Number

DIR Registration #

Address

City

State

Zip-code

NONCOLLUSION DECLARATION

I, _____, declare that I am the
Name

Owner, Partner, Corporate Officer (list title), Co-Venturer

of _____
Bidding Entity

the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that 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, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that 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, or paid, and will not pay, any fee 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.

Signature of Bidder

Date Signed

(California Public Contract Code Section 7106.)

NOTE: The above Noncollusion Declaration must be submitted with the Bid Proposal. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

IRAN CONTRACTING ACT CERTIFICATION

As required by Public Contract Code ("PCC") section 2204 for contracts of \$1,000,000 or more, please insert bidder's or financial institution's name and Federal ID Number (if available) and complete one of the options below. Please note that California law establishes penalties for providing false certifications, including civil penalties equal to the greater of \$250,000 or twice the amount of the contract for which the false certification was made; contract termination; and three-year ineligibility to bid on contracts. (PCC §2205.)

OPTION #1 - CERTIFICATION

I, the official named below, certify I am duly authorized to execute this certification on behalf of the bidder/financial institution identified below, and the bidder/financial institution identified below is not on the current list of persons engaged in investment activities in Iran created by California Department of General Services ("DGS") and is not a financial institution extending twenty million dollars (\$20,000,000) or more in credit to another person/bidder, for 45 days or more, if that other person/bidder will use the credit to provide goods or services in the energy sector in Iran and is identified on the current list of persons engaged in investment activities in Iran created by DGS. (PCC §2204(a).)

<i>Bidder Name/Financial Institution (Printed)</i>	<i>Federal ID Number (or n/a)</i>
<i>By (Authorized Signature)</i>	
<i>Printed Name and Title of Person Signing</i>	
<i>Date Executed</i>	<i>Executed in</i>

OPTION #2 – EXEMPTION

Pursuant to Public Contract Code sections 2203(c) and (d), a public entity may permit a bidder/financial institution engaged in investment activities in Iran, on a case-by-case basis, to be eligible for, or to bid on, submit a proposal for, or enters into or renews, a contract for goods and services. If you have obtained an exemption from the certification requirement under the Iran Contracting Act, please fill out the information below, and attach documentation demonstrating the exemption approval.

<i>Bidder Name/Financial Institution (Printed)</i>	<i>Federal ID Number (or n/a)</i>
<i>By (Authorized Signature)</i>	
<i>Printed Name and Title of Person Signing</i>	<i>Date Executed</i>

WORKERS' COMPENSATION CERTIFICATION

Labor Code Section 3700, in relevant part, 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. Said certificate 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, ... "

I am aware of the provisions of the 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 the performance of the work of this contract. I shall supply the Owner with certificates of insurance evidencing that Workers' Compensation Insurance is in effect and providing that the Owner will receive thirty (30) days' notice of cancellation.

Name of Contractor

Signature

Print Name

Date

(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.)

DRUG FREE WORKPLACE CERTIFICATION

The Drug-Free Workplace Act of 1990 (Government Code sections 8350 et seq.) requires that every person or organization awarded a contract or grant 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, or both, 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 or grant 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 the contract or grant be given a copy of the statement required by subdivision (a) and that, as a condition of employment on the contract or grant, 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 substance at the workplace, (b) establishing a drug-free awareness program, and (c) requiring that each employee engaged in the performance of the contract or grant 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 herein, or (b) violated this certification by failing to carry out the requirements of Section 8355, that the contract or grant awarded herein 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 et seq.

I acknowledge that I am aware of the provisions of Government Code Section 8350 et seq. and hereby certify that I will adhere to the requirements of the Drug-Free Workplace Act of 1990.

Name of Contractor

Signature

Print Name

Date

SUFFICIENT FUNDS DECLARATION

Owner: City of Clovis
Contract: **Landmark Square**

I, _____, declare that I am the _____ *[insert title]* of _____, the entity making and submitting the bid for the above Contract that accompanies this Declaration, and that such bid includes sufficient funds to permit _____ *[insert name of entity]* to comply with all local, state or federal labor laws or regulations during the Contract, including payment of prevailing wage, and that _____ *[insert name of entity]* will comply with the provisions of Labor Code section 2810(d) if awarded the Contract.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and executed on _____ 20__, at _____ *[city]*, _____ *[state]*.

Date: _____

Signature

Print Name: _____

Print Title: _____

BID BOND

Bond Number: _____

KNOW ALL MEN BY THESE PRESENTS that we the undersigned _____ as Principal and _____ as Surety, are hereby held and firmly bound unto the City of Clovis, in the County of Fresno, California ("Owner") in the sum of _____ Dollars (\$_____) for payment of which sum, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the Owner a certain bid, attached hereto and hereby made a part hereof, to enter into a Contract in writing for the construction of **Landmark Square** in strict accordance with Contract Documents.

NOW, THEREFORE,

- a. If said bid shall be rejected; or, in the alternative,
- b. If said bid shall be accepted and the Principal shall execute and deliver a contract in the form of agreement attached hereto and shall execute and deliver Performance and Payment Bonds in the forms attached hereto (all properly completed in accordance with said bid), and shall in all other respects perform the agreement created by the acceptance of said bid;

then this obligation shall be void, otherwise the same shall remain in full force and effect, it being expressly understood and agreed that the liability of the Surety for any and all default of the Principal hereunder shall be the amount of this obligation as herein stated.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract on the call for bids, or to the Work to be performed hereunder, 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 WITNESS WHEREOF, the above-bounden parties have executed this instrument under several seals this ____ day of _____, 20____, the name and corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body. In the presence of:

(Notary Seal)

(Principal)

(Business Address)

(Signature)

(Corporate Surety)

(Business Address)

By: _____
(Name)

(Signature)

The rate or premium of this bond is _____ per thousand, the total amount of premium charged, \$_____.

(The above must be filled in by Corporate Surety.)

Project Specifications - Building

GENERAL PROVISIONS - SECTIONS 1-9 OF THE STANDARD SPECIFICATIONS

Sections 1-9 of the "City of Clovis Standard Specifications," dated October 1, 2020, also referred to herein as the "General Provisions," are hereby incorporated by reference in its entirety and included as an integral part of these Contract Documents. Copies of Sections 1-9 may be obtained from Clovis City Hall, 1033 Fifth Street, Clovis, California, 93612, for a nominal fee, or, free access on the City official web site at www.cityofclovis.com.

GENERAL PROVISIONS

Section 1	Definitions And Terms
Section 2	Proposal Requirements And Conditions
Section 3	Award And Execution Of Contract
Section 4	Scope Of Work
Section 5	Control Of Work
Section 6	Control Of Materials
Section 7	Legal Relations And Responsibility
Section 8	Progress And Prosecution
Section 9	Measurement And Payment

SECTION 96 - SPECIAL PROVISIONS

96-01 CONTRACT DOCUMENTS

See General Provisions §§1-9 and 4-2 for scope of the Contract Documents.

96-02 SCOPE OF WORK

The Work to be performed under this Contract as described below shall consist of furnishing all materials, equipment, supplies, labor and transportation, and performing all Work as required by and in strict accordance with the Contract Documents, all of which are made a part hereof. The Work shall be complete, including all Work, material, and services not expressly called for or shown in said Contract Documents, which may be necessary for completion and proper construction to carry out the Contract in good faith. The site of Work shall be left in a neat condition. The cost of all Work performed, furnished, and installed is to be included in the amount bid for the various items of Work with no separate compensation allowed therefore.

All Work shall be performed in accordance with the Contract Documents, the applicable portions of the [City of Clovis](#) 2020 Standard Specifications and 2012 Standard Drawings, or latest revision, and the applicable portions of the California Building Code. The scope of Work is outlined in the Contract Documents, including but not limited to the Plans and Contract Specifications. Note that all storm drain facilities shall be completed in accordance with the applicable portions of the Fresno Metropolitan Flood Control District (FMFCD) [District Standard](#), dated April 1, 2011 or latest revision.

96-03 PROPOSAL REQUIREMENTS

A. Contractor Registration

In accordance with the California State [Senate Bill No. 854](#)¹, all contractors and subcontractors bidding and performing work on Public Works Projects shall register on an annual basis with the California Department of Industrial Relations (DIR). The Contractor and all of his subcontractors must possess and maintain such registration with DIR prior to the award or execution of the contract. The City shall verify the registration on the DIR's [Contractor Registration System](#) and notify DIR using the online Public Works Compliance form [PWC-100](#) within **five (5)** days of the award of the contract.

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 Subsection [1725.5](#). It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Subsection [7029.1](#) of the Business and Professions Code or by Subsections [10164](#) or [20103.5](#) of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Subsection 1725.5 at the time the contract is awarded.

B. Electronic Certified Payroll Reporting System

Contractors and subcontractors are required to submit certified payroll records into DIR's electronic certified payroll reporting (eCPR) system. Contractors and his subcontractors are required to check with DIR for additional compliance information on its [Public Works page](#).

96-04 COMMENCEMENT OF WORK, ORDER OF WORK, TIME OF COMPLETION & LIQUIDATED DAMAGES

The contractor shall begin on-site work within **Seven (7) Calendar Days** of the date of the Notice to Proceed and shall diligently prosecute all contract Work to completion before the expiration of **three hundred sixty five (365) Calendar Days** from the date of delivery of the Notice to Proceed. The actual date of beginning the construction shall be determined by the City at the pre-construction meeting. In addition, the Contractor shall meet the following milestone deadlines during the Work:

¹ *Public Works Reforms (SB 854, 2013-2014 Chapter 28).* See import information for awarding bodies on the [DIR website](#).

In the event the completion date of the project is extended for any reason past January 31, 2022, the construction of the Transit Center Building shall still be completed the **no later than January 31, 2022**

The contractor shall not proceed with any work until receiving a "Notice to Proceed," but may order the materials necessary for construction immediately after the contract has been awarded by the City. For any material requiring delivery of more than two weeks, the Contractor shall submit a statement with a proof of order within three (3) working days after the City's approval of his submittal. Acceptable proof of order shall be document(s) from the manufacturer (not vendor) showing the order date and delivery date for the materials. For details about obtaining time extensions or compensation for delay, see General Provisions Sections 4-12 and 8-8.

96-04.1 Liquidated Damages

Liquidated damages shall accrue at a rate of **Five Thousand Dollars (\$5,000.00)** per calendar day for each and every calendar day of delay in completing the Work under this contract, and for each and every calendar day of delay in completing a milestone deadline. See above for such deadlines. Liquidated damages will be cumulative. Reference is made to the Clovis Standard Specifications Subsection 8-9 "*Liquidated Damages*."

Time of Completion and the milestone deadlines, as specified, will be enforced. Work at the project site shall progress to completion in an orderly fashion. Pursuant to the Contract Documents, liquidated damages will be assessed against the Contractor, and deducted from progress payments or release of retention, based upon calendar day delay in completion of the project or a milestone deadline.

96-05 EXECUTION OF LIQUIDATED DAMAGES

The Contractor is responsible for completing the project within the allowable calendar days as described above. The Contractor shall contact the City for inspection and final acceptance as the construction is finished (see General Provisions Section 5-22). If the construction cannot be completed by the end of completion date, the following procedure shall be taken.

96-05.1 Request for Extension

If the Contractor believes that it is entitled to an extension of time permitted under the Contract for completion, it shall comply with the Contract Documents, including but not limited to General Provisions Sections 4-12 and 8.

96-05.2 Extension of Contract Time

The City shall review any request for time extension and respond pursuant to General Provisions Section 4-12.

96-05.3 Termination of Contract

If the Contractor fails to Complete the Work within the contract time, liquidated damages shall accrue at a rate as described in Subsection 96-04 above, and the City reserves the right to terminate the Contract pursuant to General Provisions Section 8-13.

96-06 APPROVED EQUAL

96-06.1 Procedure and Qualifications

All bidders shall furnish and prepare their bids for the materials as specified in the Construction Plans and these Specifications. Pursuant to the Contractor's request, an alternative to a specified material may be considered by the City as an "approved equal" under General Provisions Section 6-4 only if all of the following apply:

- The City did not declare the specified material as a sole source pursuant to Public Contract Code section 3400(c).
- The manufacturer shall have been in the business of related field for a minimum of five (5) years and provide a list of ten successful projects, of similar construction, each of which has been in service at least three (3) years.

- Alternatives must meet or exceed all the manufacture specifications as specified in the Contract Documents. Alternatives must be comparable in shape, material, and design with the model specified in the Contract Documents.
- The bidders shall provide complete submittals of all alternate materials to the City at least seven (7) business days prior to the bid opening. A complete submittal shall include manufacture's statements, specifications and/or catalogs, at a minimum, showing the dimensions, materials, coating, colors, and time of delivery.

96-06.2 Contractor's Liabilities

It is the bidder's responsibility to provide completed submittals to the City for approval. The City will not start the review process until all information described above is received. One digital copy of submittals in PDF for each alternative shall be sent directly to the Project Engineer for review. All alternatives must be approved by the City as "approved equals" before they may be used on the Project. If a requested "approved equal" material is approved by the City more than seventy-two (72) hours before the bid opening, other bidders shall be notified of it at least seventy-two (72) hours prior to the bid opening. No alternative will be approved within seventy-two (72) hours, or after, the bid opening.

The Contractor is fully responsible for any alternative material it requested, including replacement of all defective work due to the Contractor's workmanship or materials. See General Provisions Section 6-4 "*Trade Names or Equal.*"

96-07 NOTICE TO RESIDENTS AND AGENCIES

Reference is made to General Provisions Section 8-7 "*Notice to Residents.*" Not less than *Five (5)* calendar days nor more than *Ten (10)* calendar days prior to proceeding with the work in any given area, the Contractor shall notify in writing all residents and tenants directly affected by the construction work of the nature, the approximate time for the completion of work, and anticipated inconveniences. The notice shall be on the contracting firm's letterhead and shall be signed and include the project superintendent's name and telephone number. Prior to commencing work in each given area, the Contractor shall furnish the Engineer a copy of the notice given to Residents and Tenants and shall certify the date, location and method by which the notice was delivered.

For every occurrence when property access, sewer service or water source is to be interrupted by the Contractor's work, the Contractor shall give written notice to all affected residents/tenants not less than *Five (5)* calendar days nor more than *Ten (10)* calendar days prior to said interruption. These notice(s) shall be in addition to the initial notice to residents described above.

Reference is made to General Provisions Section 7 "*Legal Relations and Responsibility.*" The Contractor shall conduct his operations in a manner, which minimizes these disruptions, shall so instruct his labor force and subcontractors to minimize disruption, and shall provide accurate and timely information to residents and businesses along the work as well as the public. All workers shall conduct themselves in a respectful and businesslike manner while engaged in work on this project.

Full compensation for providing access to property and all provisions of this section shall be included in the amount for the various items of work and no separate payment will be made therefore.

96-08 PROSECUTION AND PROGRESS

Reference is made to General Provisions Section 8 "*Progress and Prosecution,*" Section 2-7 "*Designation of Subcontractors.*" The Contractor shall be responsible for the coordination of all trades, subcontractors, material suppliers, and other public utilities agencies engaged in the Work.

96-08.1 Progress/Construction Schedule

The Contractor shall submit to the Engineer a practicable schedule as provided in General Provisions Section 8. The review or approval of such schedule by the Engineer does not release the Contractor of any obligation, does not grant any contract-time extension, and does not relieve

the Contractor of other requirements as said in the Contract. The Contractor has full responsibility for his work, material and workmanship until final acceptance of the construction.

A construction schedule shall comply with the requirements of the Contract, including but not limited to General Provisions Section 8-5.

Subsequent to the time that submittal of a progress schedule is required in accordance with these specifications, no progress payments will be made for any work until a satisfactory schedule has been submitted to the Engineer.

96-09 PROGRESS PAYMENTS AND RETENTIONS

Reference is made to General Provisions Section 9-6 "*Partial (Progress) Payments and Retentions.*" The Contractor shall submit an invoice to the City for partial payment in the same format of the Bid Items defined in the Bid Proposal. The Contractor shall provide support documents along with the invoice for progress payment including weight tags for all quantified materials.

96-09.1 Withholding Payment and Deduction

The Contractor shall Complete the Work within the allowable calendar days as stated in the Subsection 96-04 "*Commencement of Work, Order of Work, Time of Completion & Liquidated Damages.*" Reference is made to General Provisions Section 9-7 "*Stop Payment Notices; City's Right to Withhold Payments.*" The City shall withhold payments for stop payment notices (Civil Code §9358), accrued liquidated damages, credits owed to the City, and all applicable penalties. Deduction shall be made from progress payments and release of retention.

96-09.2 Retention

Retention shall be withheld from progress payments and released to the Contractor as provided in the Contract Documents, including but not limited to General Provisions Section 9. For a project involving Federal funds, retention for a Bid Item will be released with a progress payment when that Bid Item is accepted by the City in one hundred percent (100%) completion.

96-10 CITY OF CLOVIS BUSINESS LICENSE

The Contractor to whom the contract is awarded, and all Subcontractors listed on the Contractor's Bid Proposal, or any Subcontractor substituted or added in accordance with these Specifications, must obtain a City of Clovis Business License and pay all fees associated therewith. Business Licenses are to be obtained from the City of Clovis Finance Department, 1033 Fifth Street, Clovis, CA 93612. Bidders are cautioned to contact the Finance Department to determine fee amounts prior to submitting a bid. This requirement applies regardless of the business address or location of the Contractor or any Subcontractor. Evidence satisfactory to the Engineer of the Contractor and all subcontractors having obtained a City of Clovis Business License shall also be submitted with the executed contract.

All costs associated with obtaining a business license by the Contractor and any and all Subcontractors shall be included in the various bid items; no additional payment will be made therefore.

96-11 PERMITS

96-11.1 General

As indicated in General Provisions Section 7-10 "*Permits and Licenses,*" the Contractor shall obtain all necessary permits as the first order of work. The Contractor shall satisfy himself as to the requirements and fees of various permits from the City Building Department, County, State and other agencies. The City shall reimburse the Contractor for all direct permit-fees paid by the Contractor through a progress payment. Dummy permits may be included as references for necessary permits in the appendices of this Construction Specifications herein. Contractors are responsible for checking the requirements with the corresponding agencies prior to submitting their bids.

Full compensation for all costs to obtain the required permits shall be included in the amount bid for the various items of work including all costs for application, inspection, and any charges associated therewith, except direct permit-fees. No separate payment will be made therefore.

96-11.2 City Encroachment Permit

The Contractor shall fulfill the requirements of an Encroachment Permit free of charge from the City of Clovis Construction Management for all work within a public right-of-way and public property. The Contractor shall contact the City Construction Manager at least **five (5) working days** prior to the beginning of construction with all of the following documents:

- A copy of valid State of California Contractor's License;
- A copy of valid City of [Clovis Business License](#);
- Liability Insurance Certificate ([Contract Insurance Standards on City Website](#)); and
- Traffic Control Plans from a contractor with a valid Class C-31 License or a Traffic/Civil Engineer licensed in the State of California.

The Contractor shall provide the licenses and insurance certificates from each of his subcontractors to the City unless the subcontractor's information is registered and valid on City's records.

96-12 AWARD AND EXECUTION OF CONTRACT

The bidder's attention is directed to the provisions in General Provisions Section 3-1 "*Award of Contract*" and these Special Provisions for the requirements and conditions concerning award and execution of contract.

Unless otherwise specified, the basis of award shall be determined by the comparison of the base bids for the entire Project without consideration of the alternate item(s), if any. The alternate item(s) will be awarded at the discretion of the City of Clovis. A Bid Proposal shall be submitted with all of the base and alternate bid items listed in order to be considered responsive.

96-13 CONTRACT ADMINISTRATION

The work embraced herein shall be administered by the City of Clovis Planning and Development Services Department. All inspection, progress payment preparation, and other construction reviews shall be provided by the City of Clovis, except where specifically set forth otherwise in these Special Provisions, in the required permits, or as designated by the Engineer.

Where in these Contract Specifications the terms Design Engineer and/or Engineer are used, their meaning shall be interpreted as the City Engineer, or through his designated agent at the City of Clovis Planning and Development Services Department.

Where the terms of State, Department and/or Engineer are used in the referred sections of the Caltrans Standard Specifications, their meaning shall be interpreted as the City Engineer, or through his designated agent, at City of Clovis Planning and Development Services Department.

96-14 INSURANCE REQUIREMENTS

Reference is made to General Provisions Section 7-4 "*Contractor's Insurance Requirements and Hold Harmless.*" Contractor may visit the City of Clovis [official website](#) for an example of insurance certificate required.

Contractor's insurance shall specifically cover this project only and may include all subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. An excess/umbrella policy for multiple projects shall not be accepted.

96-15 INTENT OF PLANS AND SPECIFICATIONS

Reference is made to General Provisions Section 4-1 "*Intent of Plans and Specifications.*"

96-16 REPRESENTATION ON PLANS

Basic topographic ground feature information shown on the plans is indicated by record, supplemented by word description of certain features deemed important by virtue of their proximity to the proposed work. The Contractor shall carefully examine the site of work and shall satisfy himself as to the conditions to be encountered, any changes thereto which may have occurred since preparation of the plans, and any condition or feature which needs additional investigation. Not all overhead utility lines are indicated on the plans. Reference is made to General Provisions Sections 2-2 *"Examination of Site of Work, Plans, Specifications and Contract Documents"*, and *"Scope of Work."*

96-17 CHANGES TO SCOPE OF WORK

96-17.1 **Changes in Bid Quantities**

Reference is made to General Provisions Section 2-4 *"Quantities"* and 4-10 *"Changes by Owner."*

96-17.2 **Extra Work**

Contractor shall comply with General Provisions Sections 4-10, 4-11, and 4-12. No additional compensation, neither monetary nor time extension, shall be made to the Contractor unless the Engineer classifies a work as Extra Work and accepts it with his written approval prior to the beginning of such work to be performed by the Contractor. In the absence of such approved Contract Change Order or any other written order of the Engineer, such work shall be considered as one part of the Contract and the Contractor shall not be entitled to any additional compensation.

Contractor shall comply with General Provisions Section 4-12 if he demands an additional compensation, whether money or time, for any work. Such proposal shall clearly define the details of Extra Work including scope of work, location, reason of changes, quantities of labor, materials, and all associated charges, additional compensation in demand by the Contractor, and time extension for completion of Extra Work.

96-17.3 **Claim**

Reference is made to General Provisions Section 4-12 *"Procedures for Additional Money or Time – Notices, PCOs, and Claims."* If the Contractor disagrees with the City Engineer on a rejection of a PCO, the Contractor shall follow the General Provisions' procedures for pursuing a Claim. The Contractor shall provide a full and complete record showing all costs associated with his Claim to assist the City in the determination of the reasonable compensation. Otherwise, Contractor shall have waived his rights to such pursuit and any later attempts to recover such compensation or modification shall be barred.

Despite submission or rejection of a notice, PCO, or Claim, the Contractor shall proceed diligently for completion of the Contract in a timely and professional manner, and the City shall continue to make any undisputed payments in accordance with the Contract.

96-18 PRE-CONSTRUCTION CONFERENCE

A pre-construction conference will be held in accordance with the provisions in General Provisions Section 8-4 *"Preconstruction Conference"* and these Special Provisions. Prior to the start of construction, a meeting will be called by the Engineer with the Contractor, subcontractors and interested agencies affected by the work, to discuss the proposed work. At this meeting, the Contractor shall furnish to the Engineer those items required per General Provisions Section 8-4, including Insurance Certificates and Endorsements meeting the requirements of General Provisions Section 7-4 *"Contractor's Insurance Requirements and Hold Harmless."* The Contractor shall also furnish, upon request, any and all material compliance certifications.

96-19 CERTIFICATES OF COMPLIANCE

Reference is made to General Provisions Section 6-5 *"Certificates of Compliance."* The Contractor shall submit to the Engineer three (3) certified copies of reports from each company supplying the product or material, stating the product or material delivered to the work complies with the

specifications. The certificate shall be presented to the Engineer for review prior to use of the product or material in the work. No additional payment will be made for furnishing certificates and costs incurred shall be included in the prices bid for other items of work.

96-20 LABOR COMPLIANCE

Reference is made to General Provisions Section 7-2 "*Labor Code Requirements.*" The Contractor and his subcontractors shall furnish electronic payroll records to the Labor Commissioner of California Department of Industrial Relations (DIR) in accordance with the California State Senate Bill (SB) 854. The Contractor and his subcontractors shall submit all certified payroll records to the City for review in a timely manner.

96-21 INSPECTION

Reference is made to General Provisions Section 5-17 "*Inspection during Construction; Meetings*" and the City of Clovis Resolution No. 11-25. Inspection shall be made during the City's normal business hours or the Contractor must request and obtain an approval in writing from the City Engineer.

96-21.1 **Inspection Statements**

The Contractor shall meet with the Inspector on a daily basis to review construction issues. The Inspector shall prepare daily logs and weekly inspection statement for construction progress and all construction activities. The Contractor shall receive a copy of the weekly inspection statement; Contractor's failure to correct the content within five (5) working days from the date of issuance shall deemed in agreement with the content of such statement.

96-21.2 **Inspection Fees**

There is no fee to the Contractor for City inspection on a public project during City's regular business hours. However, if the inspection is scheduled to occur on a weekend, holiday or beyond the City's normal business hours, inspection fees will be calculated at the standard City overtime/double-time rate as applicable. Inspection fees will be accumulated on a basis of **One Hundred Fifteen Dollars (\$115)** per hour. A minimum of four (4) hours will be charged to the Contractor for inspection on a weekend or holiday. The Contractor shall be responsible for such inspection fees and all additional expenses associated with the inspection beyond the City's regular business hours.

The number of inspection hours will be determined by the City in reference to the Contractor's certified payrolls. Failure to pay the fees will be a cause to deduct the amount from monies due the Contractor. In the event the Contractor schedules the construction for completion but has not completed the work to be inspected or made an effort to do so, the Contractor may be billed at the standard City hourly rate for the cost of time expended by City inspectors in preparing for and making the determination that the work has not been satisfactorily completed to warrant an inspection.

96-22 PRESERVATION OF PROPERTY

The removing, relocating, salvaging, and reinstalling of various facilities shall conform to the provisions of General Provisions Section 5-9 "*Preservation of Property*" and these Special Provisions.

All existing traffic signs, barricades, posts, mailboxes, delineators, pavement striping and markings, reflective markers, etc. which interfere with construction shall be inventoried on a map, removed, relocated, salvaged, and reinstalled as directed by the Engineer.

All other miscellaneous street facilities within the right-of-way shall remain unless otherwise noted on the Plans.

Full compensation for removing, salvaging, and reinstalling all the various miscellaneous facilities as specified herein and designated on the Plans, including any earthwork involved, shall be

considered as included in the unit price bid for the various items of work, and no additional payment will be made therefore.

96-23 CLEANUP

Reference is made to General Provisions Sections 4-13 "*Interim Cleanup*," 5-12 "*Disposal of Material Outside the Right-of-way*," and 5-21 "*Final Cleanup*." The Contractor shall clean up and dispose of all excess materials and other debris in any right-of-way or ground occupied by him, and shall restore utilities and improvements on public or private property which have been damaged by his operations.

A final walk-through inspection will be made by the City prior to final acceptance of the project.

96-24 CONSTRUCTION SURVEYING

Reference benchmark information, if there is any, is provided on the Construction Drawings. The Contractor shall be responsible for construction survey stakes and marks for the project. The Contractor shall also be responsible for preserving construction survey stakes and marks for the duration of their usefulness, and shall be fully responsible for the cost of any replacement or loss during construction.

The Contractor shall preserve property line and corner survey markers, and any permanent Survey Monuments, except where their destruction is unavoidable when the Contractor is proceeding in accordance with accepted practice. Unless otherwise specified on the Plans or herein, all such property line and survey markers or Permanent Monuments that are destroyed or disturbed by the work shall first be tied in an approved manner and replaced at the conclusion of work. Property line and corner survey markers and Permanent Survey Monuments that otherwise are lost or disturbed by the Contractor's operations shall be replaced at the Contractor's expense. All property line and corner markers and Permanent Monuments are to be replaced by a Registered Civil Engineer appropriately licensed for land surveying, or a Licensed Land Surveyor.

At the conclusion of the project, the Contractor's surveyor shall provide a certificate stating that the improvements are installed at the lines and grades indicated on the approved "AS-BUILT" construction plans.

96-25 COMPACTION TESTS

Reference is made to General Provisions Section 6-9 "*Compaction Tests*." Where compaction percentage is mentioned in these Specifications or on the plans, it shall mean relative compaction with optimum moisture content (dry weight basis) in accordance with Caltrans Test Method No. California 216. If the in-place moisture content of the soil at the time of the test is not within 2% of optimum, the test shall be considered failed.

The Contractor shall give written notice to the Engineer two (2) working days in advance of when he desires the required compaction tests to be taken. The initial tests will be taken at the expense of the City. Any further tests needed to check re-compacted areas because of failure to pass the original test shall be at the expense of the Contractor. The Engineer shall specify the locations where compaction tests are to be made.

96-26 EXISTING UTILITIES

Reference is made to General Provisions Section 4-6 "*Existing Facilities and Structures Shown on Plans*." The Engineer has made a diligent attempt to show on the Plans all the pertinent intersecting utilities that may affect the work. The Contractor shall exercise extreme caution in excavating for this project and shall protect existing utilities from damage inasmuch as the exact location is unknown until exposed by the excavation.

The Contractor shall notify Underground Service Alert (USA) by calling 811 or (800) 227-2600 at least two (2) working days prior to excavation. All existing utility mains and service lines shall be kept in constant service during the construction of this project. Hand excavating shall be employed where necessary to safely expose existing utilities.

Prior to beginning work, the Contractor shall pothole all intersecting utilities in order to verify their exact location and depth. This work shall be performed in advance to allow the engineer to make necessary modifications prior to commencing work.

Full compensation for all costs involved in protecting existing utilities shall be included in the amount bid for the various items of work and no separate payment will be made therefore.

96-27 COORDINATION WITH UTILITIES AND OTHER CONTRACTORS

There may be construction work performed by others at or near the location of the work to be performed under this contract. The Contractor shall coordinate his operations with other contractors and utility agencies with operations adjacent to or within the work area to prevent delays or hindrances to their work.

Any claims for delays resulting from the Contractor's failure to coordinate with other contractors or utility companies having interest in the work shall be at the Contractor's expense and no additional compensation shall be made therefore.

Full compensation for all costs involved in coordination and cooperation with others shall be included in the amount bid for the various items of work and no separate payment shall be made therefore.

96-28 HAZARDOUS MATERIAL

This project may require excavations extend deeper than four (4) feet below the surface. Please see General Provisions Section 7-14.2 for requirements for such excavations.

96-29 SOURCE OF CONSTRUCTION WATER AND USAGE

Furnishing and applying water shall conform to the requirements of General Provisions Sections 5-13 "*Electric and Water Service*" and 10-1 "*Dust Control*," except references therein to the provision of water by the City to the Contractor at no cost.

Water for this project may be obtained by the Contractor from a City approved source at locations determined by the City Engineer. The Contractor shall furnish all necessary equipment to load and transport water to the job site. If the City-approved source is a point on the City municipal water supply, the Contractor shall obtain and use a construction water meter from the City of Clovis Public Utilities Department Corporation Yard Office at 155 N. Sunnyside Avenue, for the duration of the project. The Contractor shall be responsible to pay all fees and charges related thereto, including charges for all water used, all as determined by the Public Utilities Department. The Contractor will be held responsible for the proper use of water facilities and be subject to applicable penalties for misuse. Any connection to the City Municipal Water System shall have an approved backflow prevention device. At the conclusion of the project, if any fees or charges for water obtained from the City have not been paid, the amount owed will be deducted from payments due the contractor.

Should the Contractor obtain water from other sources, he shall make his own arrangements, obtain all necessary permits, and pay all fees and charges. The source of water proposed for use by the Contractor shall be approved by the Engineer in advance, and shall be chemically and biologically appropriate for the uses intended.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work necessary and involved in developing a water supply, furnishing, transporting, and applying water, and paying all fees and charges related thereto, shall be considered as included in the prices paid for the various contract items of work, and no separate payment will be made.

96-30 TWO-YEAR GUARANTEE

In addition to guarantees and warranties required elsewhere in the Contract Documents, the Contractor shall and hereby does guarantee all Work for a period of two years after completion of the Work and shall repair or remove and replace any and all such Work, together with any other Work which may be displaced in so doing, that is found to be defective in workmanship and/or materials within the two-year period, without expenses whatsoever to the Owner, ordinary wear

and tear and unusual abuse or neglect excepted. In the event of failure to comply with the above-mentioned conditions within a week after being notified in writing, the Owner is hereby authorized to proceed to have the defects remedied and made good at the expense of the Contractor who hereby agrees to pay the cost and charges therefor immediately on demand. Such action by the owner will not relieve the Contractor of the guarantee required by this article or elsewhere in the contract document.

If, in the opinion of the Owner, defective work creates a dangerous condition or requires immediate correction or attention to prevent interruption of operations of the Owner, the Owner will attempt to give the notice required by this article. If the Contractor cannot be contacted or does not comply with the Owner's request for correction within a reasonable time as determined by the Owner, the Owner may, notwithstanding the provisions of this article, proceed to make such correction or provide such attention; and the costs of such correction or attention shall be charged against the Contractor. Such action by the Owner will not relieve the Contractor of the guarantees required by this article or elsewhere in the contract documents.

This article does not in any way limit the guarantee on any items for which a longer guarantee is specified or on any items for which a manufacturer or supplier gives a guarantee for a longer period, or limit the statutory time for the Owner to file an action related to patent or latent deficiencies. The Contractor agrees that its two-year guarantee applies to its work in addition to any guarantee from a manufacturer or supplier; and the Contractor shall furnish the Owner all appropriate guarantee or warranty certificates upon completion of the project. No guarantee period whether provided for in this article or elsewhere shall in any way limit the liability of Contractor or his sureties or insurers under the indemnity or insurance provisions of the General Provisions.

96-31 COST REDUCTION INCENTIVE

The Contractor may submit to the City Engineer, in writing, proposals for modifying the plans, specifications, or other requirements of the contract for the sole purpose of reducing the cost of construction, pursuant to General Provisions Section 5-24.

96-32 CLOSING-OUT THE PROJECT

All contract work shall be finished in all parts and meet all requirements including all corrective and punch-list work in reference with General Provisions Section 1-8 "*Completion*." Closeout of the Contract shall conform with the Contract Documents, including but not limited to General Provisions Section 9.

96-32.1 Statement of Completion

The Contractor shall submit a written notice to the City Inspector indicating the Work has been completed in accordance with the Contract and requesting the City for a final walkthrough and inspection. After the inspection, the contract will be temporarily suspended for no more than five (5) working days for the City to generate a punch list. The Contractor shall resume with the construction within three (3) working days after receipt of a punch list. When Contractor performs the punch list and all other required Work and believes it is Complete, it shall again request an inspection by the City, which shall issue another punch list if not Complete. The Work shall not be Complete until inspection indicates that all of the punch list and other required Work has been performed.

96-32.2 Final Payment Application

The Contractor may submit his final payment application to the City after inspection indicates that all of the punch list and other required Work has been satisfactorily performed. Inspector along with his written statement of Completion. The Contractor's final invoice shall cover the payment in full as stated in the Contract including all adjustments to the quantities of bid items, additional compensation, and/or deduction previously approved through the contract change orders.

96-32.3 As-Built Record

The Contractor shall keep an accurate record of horizontal alignment, type, or location of improvements on the approved plans by neatly marking the changes on a set of construction plans.

Said plans shall be submitted to the City for review prior to Completion and shall become the property of the City if approved. As-built plans shall be in good condition, free of tatters, soil marks, etc., when submitted for City review.

In the event the Contractor provided his own surveying to set vertical control and grade, then any changes to vertical elevations of improvements shall also be marked on the plans. The Contractor's surveyor shall provide a certificate stating that the improvements are installed at the lines and grades indicated on the approved "AS-BUILT" construction plans and all changes are properly recorded.

Full compensation for keeping this "as-built record" shall be included in the amount bid for mobilization, and no separate payment will be made therefore.

END OF SECTION

AGREEMENT (BUILDING PROJECT)

This agreement ("Agreement") is made at the City of Clovis, California, by and between _____ [*Contractor*], hereinafter called the "Contractor," and the City of Clovis, hereinafter called the City or Owner.

WITNESSETH: That the Contractor and the Owner, for the consideration hereinafter named, agree as follows:

ARTICLE I. SCOPE OF WORK. The Contractor agrees to furnish all labor and materials, including tools, implements and appliances required, and to perform all the work in a good and workmanlike manner, free from any and all liens and claims of mechanics, materialmen, subcontractors, artisans, machinists, teamsters, draymen and laborers required for the Landmark Square ("Project") as described in the Scope of Work in the Contract Documents.

RELATIONSHIP OF PARTIES. Contractor, its subcontractors, and their respective officers, associates, agents, volunteers and employees acting to perform the services under this Agreement shall act as independent contractors and not as officers, employees, or agents of the Owner for any purpose. Contractor is engaged in an independently established trade, occupation, or business to perform the services required by this Agreement and is hereby retained to perform work that is outside the usual course of Owner's business. Contractor is free from the control and direction of Owner in connection with the manner of performance of the work. Nothing contained in this Agreement shall be deemed to create any contractual relationship between Owner and Contractor's employees or subcontractors, nor shall anything contained in this Agreement be deemed to give any third party, including but not limited to Contractor's employees or subcontractors, any claim or right of action against Owner. Contractor shall have no authority, express or implied, to bind Owner to any obligation whatsoever.

ARTICLE II. CONTRACT; CONTRACT DOCUMENTS. The Contract, which may also be referred to as the Contract Documents, consists of those documents related to the Project as specified in the Owner's Standard Specifications §1-9. If there is a conflict between the Contract Documents, it shall be resolved pursuant to Standard Specifications §4-2.

ARTICLE III. PAYMENT. The Owner agrees to pay the Contractor the following sum for satisfactory performance of the Work:

_____ Dollars (\$ 0.00)

This price may be based, in part or in whole, upon the estimated quantities of materials to be used as set forth in the Contractor's Bid Proposal; and upon completion of the Project, the final contract price shall be revised, if necessary, to reflect the true quantities used at the stated unit price thereof as contained in the Contractor's Bid Proposal hereto attached.

ARTICLE IV. PROGRESS OF THE WORK. The Contractor shall begin the Work, and shall complete the Work, as required by the Contract Documents, including but not limited to Specifications Section 96-04.

ARTICLE V. TERMINATION. Owner may terminate or suspend this Agreement as permitted in the Contract Documents.

ARTICLE VI. INDEMNITY AND INSURANCE. Contractor shall indemnify and hold harmless and covered as additional insured Owner and its officers, officials, employees, and agents as required below and in the Contract Documents, and shall

provide insurance as follows:

A. Insurance Requirements For Contractors

With construction risks, Contractor shall, at its sole cost and expense, procure and maintain for the duration of the contract, insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees, or subcontractors.

B. Minimum Scope of Insurance

In addition to the requirements of the Standard Specifications and other contract documents, coverage shall be at least as broad as:

1. Insurance Services Office Commercial General Liability coverage (occurrence form CG 0001).
2. Insurance Services Office form number CA 0001 (Ed. 1/87) covering Automobile Liability, code 1 (any auto).
3. Workers' Compensation insurance as required by the State of California and Employer's Liability Insurance.

C. Minimum Limits of Insurance

In addition to the requirements of the Standard Specifications and other contract documents, Contractor shall maintain limits no less than:

1. General Liability: \$5,000,000 per occurrence for bodily injury, personal injury, and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.
2. Automobile Liability: \$1,000,000 per accident for bodily injury and property damage.
3. Employer's Liability: \$1,000,000 per accident for bodily injury or disease.

D. Deductibles and Self-Insured Retentions

Any deductibles or self-insured retentions must be declared to and approved by the Owner. At the option of the Owner, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the Owner, its officers, officials, employees and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

E. Other Insurance Provisions

The general liability and automobile liability policies are to contain, or be endorsed to contain, the following provisions:

1. The Owner, its officers, officials, employees, agents and volunteers are to be covered as insureds as respects: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the contractor; premises owned, occupied or used by the Contractor; or automobiles owned, leased, hired, or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the Owner, its officers, officials, employees, agents or volunteers.

2. For any claims related to this project, the Contractor's insurance coverage shall be primary insurance as respects the Owner, its officers, officials, employees, agents and volunteers. Any insurance or self-insurance maintained by the Owner, its officers, officials, employees, agents or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.
3. Any failure to comply with reporting or other provisions of the policies, including breaches of warranties, shall not affect coverage provided to the Owner, its officers, officials, employees, agents or volunteers.
4. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
5. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) calendar days' prior written notice by certified mail, return receipt requested, has been given to the Owner.
6. During the course of the Contract, the Contractor is responsible for all damages, theft, or other losses in regards to materials, supplies or equipment to be used in the work.
7. The Contractor shall furnish a Builder's/Contractor's Risk policy in an amount sufficient to cover all damages, theft, or loss of materials, supplies or equipment to be used in the work. The policy shall name the City of Clovis as also insured.
8. The contractor shall name the City as "Additional Insureds" for Completed Operations for a period of not less than ten (10) years.

Builders Risk Insurance

The Contractor shall effect and maintain in the name of the Contractor and the Owner "All Risk" (excluding Earthquake and Flood) Builders Risk Insurance upon the entire work of this contract to 100 percent of the replacement value thereof, including items of labor and materials in place or to be used as part of the permanent construction, including surplus miscellaneous materials and supplies incident to the work, and such scaffolding, staging, towers, forms and equipment as are not owned or rented by the Contractor, the cost of which is not included in the cost of the work. **EXCLUSIONS:** This insurance does not cover any tools owned by mechanics, any tools, equipment scaffoldings, staging, towers, and forms, rented or owned by the Contractor, the capital value of which is not included in the cost of the work or any shanties or other structures erected for the sole convenience of the workmen. Permission is granted for deductible on perils other than fire and Extended Coverage Endorsement perils of not more than \$500.

In the event of a partial or total destruction by the perils insured against, of any or all of the work and/or materials herein provided for, at any time prior to the final completion of the contract and the final acceptance by the Owner of the work or materials to be performed or supplied thereunder, the Contractor shall promptly reconstruct, repair, replace, or restore all work or materials so destroyed or injured at his sole cost and expense. Nothing herein provided for shall in any way excuse the Contractor or his surety from the obligation of fulfilling all the required materials and completing the work in full compliance with the terms of the Contract.

F. Acceptability of Insurers

Insurance is to be placed with insurers acceptable to the City.

G. Verification of Coverage

Contractor shall furnish the Owner with original endorsements effecting coverage required by this clause. The endorsements are to be signed by a person authorized by that insurer to bind

coverage on its behalf. All endorsements are to be received and approved by the Owner before work commences. The Contractor's insurer shall provide complete, certified copies of all required insurance policies, including endorsements affecting the coverage required by these specifications.

H. Subcontractors

Contractor shall include all subcontractors as insured under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverage for subcontractors shall be subject to all of the requirements stated herein.

ARTICLE VII. BONDS. The Contractor shall forthwith furnish in triplicate, a faithful performance bond on the Owner's form in an amount equal to 100% of the contract price and a labor and materials bond in an amount equal to 100% of the contract price, both bonds to be written by a surety company acceptable to the Owner and in the form prescribed by law.

ARTICLE VIII. WARRANTY. Contractor warrants and guarantees the Work as detailed in the Contract Documents, including but not limited to Specification sections 3-5, 5-23, 6-10, 7-23, and 96-30.

ARTICLE IX. ENTIRE AGREEMENT. The Contract constitutes the entire agreement between the parties relating to the Project, and supersedes any prior or contemporaneous agreement between the parties, oral or written, including the Owner's award of the Project to Contractor, unless such agreement is expressly incorporated herein. The Owner makes no representations or warranties, express or implied, not specified in the Contract. The Contract is intended as the complete and exclusive statement of the parties' agreement pursuant to Code of Civil Procedure section 1856.

ARTICLE X. EXECUTION OF OTHER DOCUMENTS. The parties to this Agreement shall cooperate fully in the execution of any and all other documents and in the completion of any additional actions that may be necessary or appropriate to give full force and effect to the terms and intent of the Contract.

ARTICLE XI. EXECUTION IN COUNTERPARTS. This Agreement may be executed in counterparts such that the signatures may appear on separate signature pages. A copy, or an original, with all signatures appended together, shall be deemed a fully executed Agreement.

ARTICLE XII. BINDING EFFECT. Contractor, by execution of this Agreement, acknowledges that Contractor has read this Agreement and the other Contract Documents, understands them, and agrees to be bound by their terms and conditions. The Contract shall inure to the benefit of and shall be binding upon the Contractor and the Owner and their respective successors and assigns.

ARTICLE XIII. SEVERABILITY; GOVERNING LAW; CHOICE OF FORUM. If any provision of the Contract shall be held invalid or unenforceable by a court of competent jurisdiction, such holding shall not invalidate or render unenforceable any other provision hereof. The Contract shall be governed by the laws of the State of California. Any action or proceeding seeking any relief under or with respect to this Agreement shall be brought solely in the Superior Court of the State of California for the County of Fresno, subject to transfer of venue under applicable State law.

ARTICLE XIV. AMENDMENTS. The terms of the Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever except by written agreement signed by the parties and approved or ratified by the City Council.

ARTICLE XV. ASSIGNMENT OF CONTRACT. The Contractor shall not assign or transfer by operation of law or otherwise any or all of its rights, burdens, duties or obligations without the prior written consent of the surety on the payment bond, the surety on the performance bond, and the Owner.

ARTICLE XVI. WRITTEN NOTICE. Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified or overnight mail to the last business address known to the person who gives the notice.

IN WITNESS WHEREOF, they have executed this Agreement the _____ day of _____, 20____.

CONTRACTOR

CITY OF CLOVIS

[Contractor]
Company

By _____
City Manager, Luke Serpa

By _____
Representative

By _____
City Clerk, John Holt

PERFORMANCE BOND

Bond Number: _____

KNOW ALL MEN BY THESE PRESENTS that we, _____, as Principal, and _____, as Surety, are held and firmly bound unto the City of Clovis, in the County of Fresno, State of California, hereinafter called the "Owner," in the sum of _____ Dollars (\$_____) for the payment of which sum well and truly made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, to the Owner for the full performance of a certain contract with the Owner, the terms of which are incorporated herein by reference, dated _____, 20____, for construction of

the Landmark Commons Contract, at 735 Third Street, Clovis CA 93612, which consists of on/off site construction and building construction for the Senior Activity Center and Transit Center (the "Contract").

The condition of this obligation is such that, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions thereof that may be granted by the Owner, with or without notice to the Surety, and for the period of time specified in the Contract after completion for correction of faulty or improper materials and workmanship and during the life of any guaranty or warranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreement of any and all duly authorized modifications of said Contract that may hereafter be made, then this obligation is to be void, otherwise to remain in full force and virtue.

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

No further agreement between Surety and Owner shall be required as a prerequisite to the Surety performing its obligations under this bond. In the event that the Surety elects to complete the Work of the Contract after termination of the Contract by Owner, the Surety may not hire Principal, or any of Principal's owners, employees, or subcontractors, to perform the Work without the written consent of Owner, and the Owner may grant or withhold such consent within its sole discretion.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals this _____ day of _____, 20____, hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

(To be signed by _____)
 (Principal and Surety, _____)
 (and acknowledged and _____)
 (Notarial Seal attached _____)

(Affix Corporate Seal)

 (Individual Principal)

 (Business Address)

(Affix Corporate Seal)

(Corporate Principal)

(Business Address)

(Affix Corporate Seal)

(Corporate Surety)

(Business Address)

By: _____

The rate of premium on this bond is _____ per thousand.

The total amount of premium charged is _____.

The above must be filled in by Corporate Surety.

PAYMENT BOND

(Labor and Material)

Bond Number: _____

KNOW ALL MEN BY THESE PRESENTS:

That WHEREAS, the City of Clovis, in the County of Fresno, California (the "Owner" of the public works contract described below) and _____, hereinafter designated as the "Principal," have entered into a Contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to construct

the Landmark Commons Contract, at 735 Third Street, Clovis CA 93612, which consists of on/off site construction and building construction for the Senior Activity Center and Transit Center

which said agreement dated _____, 20____, and all of the Contract Documents are hereby referred to and made a part hereof;

and

WHEREAS, the Principal is required, before entering upon the performance of the work, to file a good and sufficient bond with the body by whom the Contract is awarded to secure the claims arising under said agreement.

NOW, THEREFORE, THESE PRESENTS WITNESSETH:

That the said Principal and the undersigned _____ ("Surety") are held and firmly bound unto all laborers, material men, and other persons, and bound for all amounts due, referred to in Civil Code section 9554, subdivision (b), in the sum of _____ Dollars (\$_____) which sum well and truly be made, we bind ourselves, our heirs, executors, administrators, successors, or assigns, jointly and severally, by these presents.

The condition of this obligation is that if the said Principal or any of its subcontractors, or the heirs, executors, administrators, successors, or assigns of any, all, or either of them, shall fail to pay any of the persons named in Civil Code section 9100, or any of the amounts due, as specified in Civil Code section 9554, subdivision (b), that said Surety will pay the same in an amount not exceeding the amount hereinabove set forth, and also in case suit is brought upon this bond, will pay costs and reasonable attorney's fees to be awarded and fixed by the Court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void, otherwise it shall be and remain in full force and effect.

And the said Surety, for value received, thereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of said contract or the specifications accompanying the same shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration, or addition.

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

(To be signed by _____)
(Principal and Surety, _____)
(and acknowledged and _____)
(Notarial Seal attached _____)

Principal

Surety

By: _____
Attorney-in-Fact

The above bond is accepted and approved this _____ day of _____.

ARCHITECTURAL SPECIFICATIONS - DIVISION 01-33

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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. Phased construction.
- 4. Work by Owner.
- 5. Work by separate contracts.
- 6. Owner furnished, contractor installed products.
- 7. Access to site.
- 8. Coordination with occupants.
- 9. Work restrictions.
- 10. Specification and drawing conventions.

- B. Related Section:

- 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:

City of Clovis – Landmark Square
735 Third street
Clovis, CA 93612

Architect's Project Number: 2016-39

- B. Owner:

City of Clovis
1033 Fifth Street
Clovis, CA 93612

Telephone: N/A

Contact: David Merchen.

C. Architect:

Paul Halajian Architects
389 Clovis Ave., Suite 100
Clovis, CA 93612

Telephone (559) 297-7900
Contact: Paul Halajian

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. All construction and services required for the construction of the new Landmark Square Senior Activity Center and Transit Center Buildings, and related Sitework.
 - a. Construction staking for the project will be provided by the Contractor. Refer to Division 0, Section 96-24 for additional information.

1.5 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.

1. None

C. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Installation of Data Equipment and Camera Security.
 - a. Company: City of Clovis.
2. Installation of Office Equipment:
 - a. Company: CORE Spaces and Design
3. Installation of Keyless Entry, Intrusion System.
 - a. Company: Matson Alarm Company
4. Installation of Overhead Power Lines and Power Poles at Alley.

- a. Company: Pacific Gas and Electric
- 5. Installation of Chainlink Fence along northern property line
 - a. Company: City of Clovis
- D. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.
 - 1. None.

1.6 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Preceding Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
- C. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1.7 OWNER-FURNISHED CONTRACTOR-INSTALLED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.
- B. Owner-Furnished Products:
 - 1. Exterior Corrugated Metal Walls panels

1.8 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.

1.9 COORDINATION WITH OCCUPANTS

- A. No On-Site Owner Occupancy: Owner will not occupy site during entire construction period.
- B. Adjacent Property Owner Occupancy: Resident will occupy adjacent residential properties and property owners will occupy adjacent commercial and industrial properties during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing alley, 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 approval of authorities having jurisdiction.
 - 2. Refer to Division 00, Section 96-07 for notification requirements.

1.10 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 7:00 p.m., Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturdays, except as otherwise indicated.
 - 1. From June 1st to September 1st, working hours starting at 6:00 a.m. is permissible.
 - 2. Submit a written request to the Owner for work hours outside of the indicted on-site hours; request subject to review by the Owner. Refer to Division 00, Section 96-21 for additional information.
- 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 Owner's written permission before proceeding with utility interruptions.
 - 3. Refer to Division 0 for additional requirements for Utilities.

- D. Controlled Substances: Use of tobacco and alcohol products and other controlled substances on Project site is not permitted.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

- A. General: Specifications establish minimum quality standards for products, materials, and installation requirements unless more stringent requirements are indicated on the Drawings; Drawings establish material and product location and quantity.
 - 1. Where requirements for materials and/or products indicated on the Drawings are not specified, provide heavy duty commercial grade products and materials. Submit product Submittals for final approval.
- B. Division 01 General Provisions: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. 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 shall be complied with by Contractor unless specifically stated otherwise.
- D. Drawing Content, Material and Product Identification: Materials and products are identified on Drawings by typical generic terms used in the individual Specification Sections unless materials and products are described in detail on the Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 011105
USE OF ARCHITECTS 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 an E-mail or Digital Download in DWG format.
- B. Contractor, Subcontractors, and Suppliers of this Project shall jointly execute a waiver of Liability for each use of the Architect's 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 E-mail or Digital Download transmittal or any files contained on it shall not be duplicated without written permission of the Architect.
- D. Any electronic data, files or information provided under the completion of the "ELECTRONIC DATA FILE DISTRIBUTION WAIVER OF LIABILITY FORM" are the property of the Professionals and Consultants listed on the liability form. It is understood and agreed that the information contained in the distributed electronic data files shall not be copied or duplicated for any use other than for this Project. It is

understood 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.

- E. The user 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 the Team shall not be liable for the completeness or accuracy of any material provided on electronic media.
- F. The user 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.
- G. The Team bears no responsibility for the information in the electronic data files once it leaves the office of the Architect. The user 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 Digital Download or CD.

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)

ELECTRONIC DATA FILE DISTRIBUTION WAIVER OF LIABILITY

Paul Halajian Architects
389 Clovis Ave., Suite 100
Clovis, California 93612

Project: **City of Clovis – Landmark Square**

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 office of **Paul Halajian Architects**. 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 Digital Download or CD.

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 012300 ALTERNATES

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 alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, the Owner will notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Senior Activity Center: Elimination of finishes in Room 108 Fitness Room.
 - 1. Base Bid: Construction of Project as indicated on Drawings.
 - 2. Deductive Alternate:
 - a. Eliminate Gypsum Board finishing. Provide Level 1 only
 - b. Eliminate suspended ceiling
 - c. Eliminate light fixtures, maintain electrical stubs to room.
 - d. Maintain mechanical systems. Cap ducts that feed to room. Omit ceiling diffusers.
- B. Alternate No. 2: Senior Activity Center and Transit Center: Elimination of Emergency Generator
 - 1. Base Bid: Construction of Project as indicated on Drawings.
 - 2. Deductive Alternate: Omit Generator and related transfer switches. All underground conduit and concrete slab to remain.
- C. Alternate No. 3: Senior Activity Center and Transit Center: Eliminate Metal Roof Roofing
 - 1. Base Bid: Construction of Project as indicated on Drawings.
 - 2. Deductive Alternate: Provide Single Ply roofing system throughout .
- D. Alternate No. 4: Senior Activity Center: Eliminate wood wainscot in Halls 127,137
 - 1. Base Bid: Construction of Project as indicated on Drawings.
 - 2. Deductive Alternative: Eliminate wood wainscot on wall. Provide standard painted gypsum board finish.
- E. Alternate No. 5: Senior Activity Center and Transit Center: Alternate building siding
 - 1. Base Bid: Construction of Project as indicated on Drawings.
 - 2. Deductive Alternative: Omit Wood siding and finish. Provide vertical Cement Board of similar profile and field painted finish.
- F. Alternate No. 6: Senior Activity Center: Omit Roof Overhang at Multi-Purpose
 - 1. Base Bid: Construction of Project as indicated on Drawings.
 - 2. Deductive Alternative: Omit Metal roof, deck and framing at the west side of the high multi-purpose roof. Omit suspended lighting and vertical metal tube-steel panels on the north and south side of the Multi-Purpose Entry.

- G. Alternate No. 7: Senior Activity Center and Transit Center: Interior storefront windows and doors.
1. Base Bid: Construction of Project as indicated on Drawings.
 2. Deductive Alternative:
 - a. At all interior Storefront locations, omit storefront and replace with interior aluminum frames (Spec section 081200). Door type, Glazing type, and any Fire rated assembly requirement to remain.
- H. Alternate No. 8: Senior Activity Center and Transit Center: Exterior storefront windows and doors.
1. Base Bid: Construction of Project as indicated on Drawings.
 2. Deductive Alternative:
 - a. All exterior storefront to be reduced to 10'-0" a.f.f, in lieu of 12'-0" a.f.f. All properties of storefront to remain.
- I. Alternate No. 9: Senior Activity Center: Wood Ceiling Panel System.
1. Base Bid: Construction of Project as indicated on Drawings.
 2. Deductive Alternative:
 - a. Omit wood ceiling panels and replace with Suspended Acoustical Ceiling Panel System in the following rooms:
 - 1) 125, 126, 133, 140, 148.
 - b. Mechanical systems to be extended to lay within ceiling system.
 - c. Lighting to remain.

END OF SECTION

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 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
 - 2. 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 by a savings in cost.

1.4 SUBMITTALS

- A. Substitution Requests: Submit a digital PDF copy of each request for consideration; submit a paper copy upon Architect's request. 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: (Format as follows)

- 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 or Owner will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Owner 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.
- 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 Owner does not issue a decision on use of a proposed substitution within time allocated.

1.5 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.

1.6 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: Owner 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 Owner.
 - 1. Conditions: Owner 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 Provisions, 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: Owner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner 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: Owner will consider requests for substitution received after the Notice to Proceed when the following conditions are satisfied. Requests not meeting the following conditions may be considered or rejected at the discretion of Owner. All substitutions of convenience shall be a cost benefit to the Owner.

1. Conditions: Owner will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner 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. A price adjustment shall be credited to the Owner as specified in Section 012600.
 - 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)

SUBSTITUTION REQUEST FORM

FOR: Landmark Square – City of Clovis

We hereby submit for your consideration the following product instead of the specified item for the above project:

SECTION	PARAGRAPH	SPECIFIED ITEM
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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 Owner 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.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Division 00 Special Provisions 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 CHANGES IN THE WORK, GENERAL

- A. Governing Agency Review and Approval: Changes to the Contract Documents affecting changes in the Work, Contract Sum, and/or Contract Time are subject to review and approval by the authorities having jurisdiction.

1.4 MINOR CHANGES IN THE WORK

- A. Architect's Supplemental Instruction (ASI): For minor changes in the Work not involving adjustment to the Contract Sum or the Contract Time, the Owner will issue Architect's Supplemental Instructions authorizing such changes after the Owner's review and approval of Architect's Supplemental Instruction prepared by the Architect.
 - 1. 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.

1.5 PROPOSAL REQUESTS

- A. Architect/Owner-Initiated Proposal Requests: Owner 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. Proposal Requests issued by Owner are not instructions either to stop work in progress or to execute the proposed change.
 2. 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 Owner.
- B. Contractor-Initiated Proposals: If conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Owner.
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 Owner.
- C. Owner's Response: Within 7 days after receipt of Contractor's Proposal or Contractor's response to Architect/Owner initiated Proposal Request, Owner will:
1. Issue a Change Order for accepted proposals.

2. Notify the Contractor of unaccepted proposals.
3. Issue a Construction 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.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Owner will issue a Change Order for signature of Contractor. Signed Change Orders shall be included in the Contract Documents.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive (CCD): Owner may issue a Construction Change Directive on Owner's standard form to instruct Contractor to proceed with a change in the Work for subsequent inclusion in a Change Order.
 1. Construction 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.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

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 guidelines 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 DEFINITION

- A. RFI: Request for Information seeking information required by or clarification of the Contract Documents.

1.4 SUBMITTALS

- A. Submit RFI's as electronic submittals via email to the Owner and Architect.
 - 1. RFI Form: If requested by Contractor, Architect will provide Contractor with electronic copy in PDF format.
 - a. Attachments shall be electronic files in Adobe Acrobat PDF format.
 - 2. Owner will return RFIs submitted to Owner by other entities controlled by Contractor with no response.
 - 3. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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.
- 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 Owner.
 - 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. Owner's Action: Owner will review each RFI, determine action required, and respond. Allow 10 working days for Owner's response for each RFI. RFIs received by Owner 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. Owner's action may include a request for additional information, in which case Owner's time for response will date from time of receipt of additional information.

3. Owner'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 Owner in writing within 10 days of receipt of the RFI response.
 4. Distribution: One electronic PDF copy of each completed RFI review shall be distributed by the Owner to the Contractor.
- D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly unless otherwise directed in writing by Owner. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Owner.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Owner's response was received.
- E. On receipt of Owner's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Owner within 7 days if Contractor disagrees with response.
- F. Contractor's Expense for RFI's: Owner will review and respond to legitimate RFI's at no additional cost to the Contractor. RFI's determined by the Owner to be flagrant or unnecessary may have the expense for the Owner with the amount being deducted from the Contract Sum. The expense will be based on an hourly rate of \$115/hour, 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

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. Supplemental Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections:
 - 1. Division 0 Special Provisions 96-09
 - 2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
 - 4. 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 and determining unit prices for change orders.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Correlate 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 Owner at earliest possible date but no later than 7 days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual (Contractual Requirements and Technical Specification's) 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 Owner and Architect.
 - c. Owner's and Architect's project numbers.
 - 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 (Contractual Requirements and Technical Specification's) table of contents. Provide multiple line items for principal subcontract amounts in excess of 5 percent of Contract Sum.
 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.
9. Provide Schedule of Values for each bid item.
 - a. Senior Activity Center (Including all work within 5' of building perimeter and finish grading)
 - b. Transit Center (Including all work within 5' of building perimeter and finish grading)
 - c. Site Work (Onsite & Offsite)
 - d. Shade Structure

1.5 APPLICATIONS FOR PAYMENT

- A. Refer to Owner's requirements in Division 1 Special Provisions 96-09

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 "Use of Architect's Electronic Files" for the use and availability of digital data files of the Contract Drawings.
 - 3. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 4. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 SUBMITTALS

- A. Coordination Drawings:
 - 1. Initial Submittal: Submit a digital PDF of each coordination drawing for each condition where Coordination Drawings are required.
 - 2. Project Closeout:
 - a. Submit 3 printed "Record" copies and a digital PDF 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, Architect 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 Owner and 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 Owner and 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 Owner and 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, per Section 011100 "Use of Architect's Electronic 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 sections 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 and the Architect, but no later than 14 days after execution of the Agreement. Hold the conference at the City of Clovis Conference Room 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; and major subcontractors, suppliers; and other concerned parties shall attend the conference. 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. Distribution of Contract Documents.
10. Submittal procedures.
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. County alcohol, drug and tobacco policy.
22. Procedures for water main shut down.
23. Construction water use.

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: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Owner of scheduled meeting dates.
 1. 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:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFI's, Proposal Requests, and Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Possible conflicts.
 - h. Compatibility problems.
 - i. Time schedules.
 - j. Weather limitations.
 - k. Manufacturer's written instructions.
 - l. Warranty requirements.
 - m. Compatibility of materials.
 - n. Acceptability of substrates.
 - o. Temporary facilities.
 - p. Space and access limitations.
 - q. Regulations of authorities having jurisdiction.
 - r. Safety.
 - s. Testing and inspecting requirements.

- t. Required performance results.
 - u. Recording requirements.
 - v. Protection.
2. Record significant conference discussions, agreements, disagreements, including corrective measures and actions.
 3. Promptly distribute minutes of the meeting to each party present and to other parties requiring information, including the Owner and the Architect.
 4. 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.

1.5 PROGRESS MEETINGS

- A. Progress Meetings: Conduct progress meetings at the City of Clovis Conference Room at regular intervals to be established by the Architect, 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. 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 month's 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. Deliveries.
 - e. Off-site fabrication.
 - f. Access.
 - g. Site utilization.
 - h. Temporary facilities and services.
 - i. Status of correction of deficient items.
 - j. Field observations.
 - k. Status of RFI's, Proposal Requests, and Change Orders.

- l. Progress cleaning.
 - m. Quality and work standards.
 - n. Documentation of information for payment requests.
 - o. Request for Information.
 - p. Weekly certified payrolls.
 - q. Progress payments.
 - r. SWPPP reporting.
- D. 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; major subcontractors; suppliers; and other concerned parties shall attend the meeting. 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 preparing operations and maintenance data.
 - 5. Requirements for delivery of material samples, attic stock, and spare parts.
 - 6. Requirements for demonstration and training.
 - 7. Preparation of Contractor's punch list.
 - 8. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - 9. Submittal procedures.
 - 10. Responsibility for removing temporary facilities and controls.

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. Startup construction schedule.
 - 2. Contractor's construction schedule (CPM).
 - 3. Daily construction reports.
 - 4. Special reports.
- B. Related Sections include but are not limited to the following:
 - 1. Division 01 Section "Photographic Documentation."
 - 2. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 3. 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 must be started or completed before another given activity can be started.
 - 3. Successor Activity: An activity that cannot be started until the completion of another given activity.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Owner.
- C. 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 Project.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. 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.
- G. 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.
- H. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

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.
 - 3. Two paper copies.
- B. Preliminary construction schedule.
 - 1. Approval of cost-loaded, preliminary construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.
 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at weekly intervals.
- H. 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. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Review delivery dates for Owner-furnished products.
 4. Review schedule for work of Owner's separate contracts.
 5. Review submittal requirements and procedures.
 6. Review time required for review of submittals and resubmittals.
 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 8. Review time required for Project closeout and Owner startup procedures.
 9. Review and finalize list of construction activities to be included in schedule.
 10. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
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 Owner.
 - 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 Owner'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. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. 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 Owner'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.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, 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 and commissioning.
 - j. Punch list and final completion.
 - k. 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.
- E. 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.
- F. 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.
- G. 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.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (see special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.

2.4 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, 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 Owner.
- 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 requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Division 01 Section "Use of Architect's Electronic Files" for the use and availability of digital data files of the Contract Drawings.
 - 4. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 5. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 6. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 SUBMITTALS

- A. Submittal Schedule: Submit a schedule 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 Owner 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 Owner's final release or approval.
 - f. Scheduled dates for purchasing.
 - g. Scheduled dates for installation.
 - h. Activity or event number.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. General Requirements: Owner will return submittals, without review, received from sources other than Contractor.
 1. Owner and Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will be made available to the Contractor per compliance with Section 011105 "Use of Architect's Electronic Files".
- 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 transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Owner and 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 Owner'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. Owner 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 Owner before being returned to Contractor.
- E. All submittals shall be submitted in digital PDF format; paper submittals are subject to submission per Architect's request. Provide submittals that are formatted as follows.
- F. Digital Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 by 5 inches on label or beside title block for Owner's review stamp and approval markings.
 3. Provide a space approximately 2 by 3 inches on label or beside title block for Contractor's review stamp and approval markings.
 4. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Owner.
 - d. Name of Contractor.
 - e. Name of subcontractor.
 - f. Name of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.

5. Submit one copy of a digital submittal to reviewer. Paper submittal may be requested per Architect's discretion.
- G. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 by 5 inches on label or beside title block for Owner's review stamp and approval markings.
 3. Provide a space approximately 2 by 3 inches on label or beside title block for Contractor's review stamp and approval markings.
 4. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Owner.
 - d. Name of Contractor.
 - e. Name of subcontractor.
 - f. Name of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
5. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form.
 - a. Transmittal Form: Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name of Contractor.
 - 6) Name of firm or entity that prepared submittal.
 - 7) Names of subcontractor, manufacturer, and supplier.
 - 8) Category and type of submittal.
 - 9) Submittal purpose and description.
 - 10) Specification Section number and title.
 - 11) Indication of full or partial submittal.
 - 12) Drawing number and detail references, as appropriate.
 - 13) Transmittal number
 - 14) Submittal and transmittal distribution record.

- 15) Remarks.
- 16) Signature of transmitter.

- b. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Owner on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Product Options:

1. Clearly identify product options required to comply with the Contract Documents.
2. Clearly identify product options requiring selection by the Owner.

I. Deviations: Clearly identify deviations from requirements in the Contract Documents including minor variations and limitations.

J. 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 Owner's action stamp.

K. 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.

L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Contractor will submit digital or paper copies of the submittal to be reviewed by Architect, Owner, and/or one of the Architect's consultant; unless specifically indicated otherwise.
 - a. One (1) digital copy to be submitted by e-mail. Owner will verify receipt of submittal. If no verification of receipt has been provided within two (2) calendar days, contractor shall make request for verification to owner.

- b. Submittals requiring deferred approval must be submitted by digital PDF and paper copies.
 - 2. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
 - 3. Certificates and Certifications Submittals: Provide 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.
 - 4. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. 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 not suitable 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 showing 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 or concurrent with Samples.
 - 6. Submit Product Data in the following format:
 - a. One (1) digital copy to be submitted by e-mail.
 - b. Product data requiring deferred approval must be submitted by digital PDF and paper copies.
- C. 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. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit 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. One (1) digital copy to be submitted by e-mail.
 - b. Product data requiring deferred approval must be submitted by digital PDF and paper copies.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. Disposition: Maintain sets of reviewed 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.
 4. 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. Owner will return submittal with options selected.
- 5. 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 3 sets of Samples. Owner will retain 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 sets of paired units that show approximate limits of variations.
- E. 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.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
 - 5. Submit product schedule in the following format:
 - a. One (1) digital copy to be submitted by e-mail.
 - b. Paper copies may be requested at Architect's discretion.
- F. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

- K. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- L. 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.
- M. 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 American Welding Society (AWS) forms. Include names of firms and personnel certified.
- N. 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.
- O. 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.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. 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.
- S. Product Test Reports: Submit written reports indicating 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.
- T. 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:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- U. 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.

- V. 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.
- W. Field Test Reports: Submit 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.
- X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 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 not sufficient to perform services or certification required, submit a written request for additional information to Owner.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit 1 digital copy and 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Product Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, 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.

3.2 OWNER'S ACTION

- A. General: Owner will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Submittals: Owner will review each submittal, make marks to indicate corrections or modifications required, and return it. Owner 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 contract documents.
 - 2. Furnish as Corrected: Final but restricted release, work may proceed, provided written confirmation is delivered to Owner 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: 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.
- C. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

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. Testing Agency.
 - 5. 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. The Contractor shall give written notice to the Owner two (2) working days in advance of when he desires the required tests to be taken. The initial tests will be taken at the expense of the Owner. Any further re-tests needed because of failure to pass the original test shall be at the expense of the Contractor.
- C. Related Requirements:
 - 1. Divisions 02 through 33 Sections for specific test and inspection requirements.

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 Owner 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 Owner 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. 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.
- C. 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.
- D. 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.
- A. 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.
- B. 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.
- C. 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.

- D. **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.
- E. **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 Owner, 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 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 Owner. Requirements for tests and testing agency shall be as stated in the California Code of Regulations, Title 24, Part 1, 2013 California Administrative Code, Section 4-435.
 - 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.
 - 3. Owner's representative will schedule testing agency for services. Inform Owner's representative a minimum of 48 hours prior to required testing.

- B. Testing Agency Responsibilities: Cooperate with Owner 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, Owner 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 Owner 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.

1.8 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 48 hours in advance of time when Work that requires testing or inspecting will be performed or as required by the testing agency.
 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.

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 Owner.
 - 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 Owner'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 015000
TEMPORARY FACILITIES, CONTROLS, AND EROSION CONTROL (SWPPP)

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, erosion control (SWPPP), and security and protection of facilities.
- B. Related Requirements:
 - 1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
 - 2. Division 07 Sections as applicable to roofing for temporary roofing requirements.
 - 3. Division 32 Section "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
 - 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 not available for use; provide connections of services as required for construction operations.
 - 1. Water for this project may be obtained by the Contractor from a City approved source at locations determined by the City Engineer. The Contractor shall furnish all necessary equipment to load and transport water to the job site. If the City-approved source is a point on the City municipal water supply, the Contractor shall obtain and use a construction water meter from the City of Clovis Public Utilities Department Corporation Yard Office at 155 N. Sunnyside Avenue, for the duration of the project. The Contractor shall be responsible to pay all fees and charges related thereto, including charges for all water used, all as determined by the Public Utilities Department. The contractor will be held responsible for the proper use of water facilities and be subject to applicable penalties for misuse.

Any connection to the City Municipal Water System shall have an approved backflow prevention device. At the conclusion of the project, if any fees or charges for water obtained from the City have not been paid, the amount owed will be deducted from payments due to the Contractor.

2. Should the Contractor obtain water from other sources, he shall make his own arrangements, obtain all necessary permits, and pay all fees and charges. The source of water proposed for use by the Contractor shall be approved by the Owner in advance, and shall be chemically and biologically appropriate for the uses intended.
 3. Full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work necessary and involved in developing a water supply, furnishing, transporting, and applying water, and paying all fees and charges related thereto, shall be considered as included in the prices paid for the various contract items of work, and no separate payment will be made.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is not available for use; provide connections of services as required for construction operation.
1. Contractor to provide their own electric power service or apply through PG&E for the necessary electric power services as required for construction operations.

1.4 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.

1.5 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.
- C. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
1. Governing code requirements.
 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."

1.6 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. 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.
- B. 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.
- C. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.
- D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY 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 building.
- B. Temporary On-Site Offices:
 - 1. Provide (1) minimum 8'x10' temporary office for Owner use. Provide power and climate control.

2.3 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. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation type at each of the project sites. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Use of Owner's toilet facilities is not permitted.
- C. 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: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
 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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities 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.

3.2 TEMPORARY UTILITY INSTALLATION

- 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. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- C. 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.

- D. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- 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 and as permitted through PG&E.
 - 1. Install electric power service overhead unless otherwise indicated.
- 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:
 - 1. Provide superintendent with cellular telephone.

3.3 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 Owner 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. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations and emergency vehicle access. 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.
- C. 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 and emergency vehicle access. 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."
 - 5. Comply with Clovis Fire Department Standard 1.2 for "Temporary Emergency Access Roads."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Traffic control shall conform to the provisions of Subsections 7-17 "*Public Convenience*" and 7-18 "*Public Safety*" of the Clovis Standard Specifications, these Special Provisions, the Caltrans Traffic Manual, Chapter 5, "*Manual of Traffic Controls for Construction and Maintenance Work Zones*", the California 2014 "*Manual on Uniform Traffic Control Devices*" ([MUTCD](#)) and the California Supplement thereto, Part 6, "*Temporary Traffic Control*".
 - 2. Compliance with the requirements of said manual shall be considered as a minimum requirement and it shall be the responsibility of the Contractor to provide additional safety devices for a safe condition and for coordination with all

existing traffic control in place. An approved traffic control plan is required prior to beginning construction. The traffic control plan shall incorporate the restrictions below:

- a. The Contractor shall maintain at least one access to a commercial site, school and/or public facility at all times. On major streets, if construction in the paved travel lanes is necessary, at least one twelve (12') foot wide paved lane in each direction of travel shall be maintained at all times. No more than one residential street may be closed at one time and no intersection shall be closed more than forty-eight (48) hours.
 - b. The Contractor shall provide temporary safe pedestrian passageways and ADA access around a construction site at all times. Complete pedestrian paths of travel shall be provided by the Contractor in accordance with the California 2014 MUTCD, ADA Standards, CBC, and DSA-AC Reference Manual.
 - c. The Contractor shall protect the construction area from the public. Open trench or trenches shall not be more than a total of 200 feet in length after working hours. Prior to completion of work each day, the Contractor shall backfill and provide temporary trench resurfacing before leaving the site.
3. Protect existing site improvements to remain including curbs, pavement, and utilities.
 4. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Provide temporary parking areas for construction personnel.
1. Where applicable, designated areas of Owner's existing parking may be used for construction personnel when indicated on Drawings.
- F. Dewatering Facilities and Drains: 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.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. 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.
 3. Maintain and touchup signs so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."
 - 1. 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.
- J. 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.
- K. Use of Elevators: Use of elevators is not permitted.
- L. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

3.4 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 of 2003 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. Storm Water Pollution Prevention Plan Requirements: Comply with requirements of authorities having jurisdiction.

The following provisions are being required in the construction contract of this project as awarded by the City of Clovis. Their purpose is to provide detailed instructions to contractors to ensure that construction practices do not cause pollutant discharges to the storm drain system. Contractors are encouraged to use this or similar language in their contracts. The language is based upon best management practices developed by the California Storm Water Quality Task Force as presented in the California Storm Water Best Management Practices Handbook-Construction Activity. The Fresno Metropolitan Flood Control District developed the model storm water pollution prevention plan. Whether or not such provisions are included in subcontracts, the contractor is ultimately responsible for compliance by others retained by the Contractor in the performance of this contract.

The goal of these requirements is to prevent the pollution of storm water runoff on construction projects by keeping pollution out of storm drains, reducing the exposure and discharge of materials and wastes to storm water, and by reducing erosion and sedimentation.

The improvements are subject to the provisions and requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, a.k.a. Construction General Permit (the Permit), Order No. 2009-0009-DWQ. The Contractor shall be responsible for complying with all Permit requirements, as adopted by the State Water Resources Control Board (SWRCB) in July 2010, including any future revisions to that order. The Contractor shall indemnify and hold harmless the City for failure to comply with any provision or requirement of the General Construction Permit.

To ensure permit compliance, the Contractor is directed to the official web site for California Storm-water Quality Association (CASQA). The Contractor can obtain copies of the State General Construction Permit, Notice of Intent (NOI) and Notice of Termination (NOT) forms, instructions for completing the forms, and a Model Construction Activities Storm Water Pollution Prevention Plan (SWPPP).

1. General

The Contractor shall comply with all requirements for the Permit, including any laws, regulations, orders, and decrees applicable to the project. For any discrepancy or inconsistency between the compliance and this Contract, the Contractor shall immediately report to the Engineer. When a regulatory agency requests for a job site or records access, the Contractor shall immediately notify the Engineer, submit a list of all documents provided to the agency and enforcement actions as directed by the agency.

The Contractor shall indemnify and defend the City against any claim or liability arising from the violation(s) of the Permit by the Contractor or his employees. If the City incurs any fine or penalty because of the Contractor's failure to comply with a Permit requirement, law, regulation, order, or decree, the City shall deduct the amount of the fine or penalty from the Contract.

Responsibility for the Construction General Permit

The Permit states the Legally Responsible Person (LRP) or a person legally authorized to sign and certify on behalf of the LRP is responsible for obtaining permit coverage. The LRP is the person who possesses the title of the land, the leasehold interest of an estate upon which the construction activities will occur for the regulated site, or the person in charge of the municipality or public agency. The LRP is always ultimately responsible for project compliance. This individual must certify the Permit Registration Documents (PRD) and will be the recipient of any Notices of Violations (NOV) or Administrative Civil Liabilities (ACL; fines) for the project. The City Engineer shall be the LRP for the Permit.

An Approved Signatory is an individual who has legal authority to sign, certify, and electronically submit PRD and Notices of Termination on his/her behalf. The City Engineer, or his designated agent, shall be the Approved Signatory as designated by the LRP.

A Data Submitter is any individual, other City employee, contractor, laboratory, etc., authorized by the LRP or an Approved Signatory to enter data on behalf of the LRP or Approved Signatory. The Contractor shall be a Data Submitter for this project.

2. Permit Registration Documents (PRD)

The Contractor shall be responsible for applying the Permit and must electronically submit the Permit Registration Documents (PRD) prior to commencement of construction activities in the Storm Water Multi-Application Report Tracking System (SMARTS), which will be available by July 1, 2010. An LRP, or his Approved Signatory, shall electronically certify the PRD in the SMARTS. The PRD generally consists of a Notice of Intent, Risk Assessment, Post-Construction Calculations, Storm Water Pollution Prevention Plan (SWPPP), Site Map, a signed certification or statement by the LRP, and the first annual fee.

3. Preparation of a Storm Water Pollution Prevention Plan (SWPPP)

At a minimum the SWPPP must address: general project information; a construction activity schedule; pollutant sources and best management practices (BMPs); maintenance, inspection, and repair of BMPs; contractor training; site stabilization; post construction management plan, and; overall permit compliance and certifications. The Contractor shall submit a draft SWPPP to the City for review, approval, and certification no later than two weeks after receipt of the notice of award. Within 24 hours of approval by the city, the Contractor shall provide the City with a complete copy of the certified SWPPP. Any amendments to the SWPPP shall also be submitted to the City for review, approval and certification. Within 24 hours of approval, the Contractor shall provide the City with documentation and certification of such amendments.

4. Qualified SWPPP Developer (QSD)

The Contractor shall be responsible for the SWPPP unless it is provided by the City with the Contract. The Contractor shall ensure that the SWPPP is written, amended and certified by a Qualified SWPPP Developer (QSD). A QSD shall have one of the following registrations or certifications, and appropriate experience, as required for:

- a. A California registered professional civil engineer;

- b. A California registered professional geologist or engineering geologist;
- c. A California registered landscape architect;
- d. A professional hydrologist registered through the American Institute of Hydrology;
- e. A Certified Professional in Erosion and Sediment Control (CPESC)[™] registered through Enviro Cert International, Inc.;
- f. A Certified Professional in Storm Water Quality (CPSWQ)[™] registered through Enviro Cert International, Inc.; or
- g. A professional in erosion and sediment control registered through the National Institute for Certification in Engineering Technologies (NICET);

Effective two years after the adoption date (September 2, 2012) of this Permit, a QSD shall have attended a QSD training course approved by the State Water Board.

5. Implementation of SWPPP

The Contractor shall ensure the SWPPP is being implemented to protect water quality at all times throughout the entire construction project, including both dry and wet weather seasons. The Contractor shall also ensure the SWPPP is kept on-site during any construction activity and all inspection, maintenance and training documentation is included with the SWPPP.

6. Qualified SWPPP Practitioner (QSP)

The Contractor must have one individual as the Qualified SWPPP Practitioner (QSP) designated for the construction. A QSP can be an independent contractor or consultant. Effective September 2, 2011, the QSP shall have one of the pre-qualifications listed in Section VII of the 2009-0009-DWQ Permit and shall have attended the State Water Board sponsored or approved QSP Training Course.

The QSP is responsible for the implementation of BMPs on each construction, not the Contractor's superintendents. Regional Water Board inspectors may ask to meet and/or conduct an inspection with the QSP responsible for the construction, and that individual should be accessible.

7. Rain Event Action Plan (REAP)

The project QSP must develop and be in responsible charge of implementing the REAP. The REAP is a living document specific to a project site. A new REAP must be prepared/revised specific to each forecasted qualifying rain event (any likely precipitation event forecast of 50% or greater probability). However, some of the REAPs for an individual project might look similar for each construction phase.

A REAP must be developed forty-eight (48) hours prior to any likely precipitation event forecast of 50% or greater probability, which shall be determined by the National Oceanic and Atmospheric Administration (NOAA). The Contractor may check the web site for Forecast Weather Table Interface in Clovis area at <http://www.srh.noaa.gov/>.

8. Site Stabilization

All soil disturbing activities must be complete, and the site stabilized prior to terminating permit coverage.

9. Preparation of a NOT and PCSWMP

Following completion of the construction project, the Contractor shall submit a completed Notice of Termination (NOT) and Post Construction Storm Water Management Plan (PCSWMP) to the City for review, approval, and signature. Within 24 hours of approval, the Contractor shall provide the City with a final copy of the project's PCSWMP. The City shall submit the executed NOT to the Central Valley Regional Water Quality Control Board (RWQCB) for termination of General Construction Permit coverage.

10. Documents to the State Water Board

Annual Report

Annual Reports must be submitted by the City for a project that is enrolled under 2009-0009-DWQ for more than one continuous three-month period. The Annual Reports will be submitted electronically in SMARTS

- 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. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
 - 3. Site Security: Fence and entrance gates shall remain closed and secure throughout the entirety of scheduled construction. Entering the construction site shall be limited to Owner, Contractor, and Sub-Contractors performing their scope of work during hours of operation.
 - a. When entering and exiting occurs during the construction, an attendant must be present at all times supervising the entrance gate. Otherwise, the gate must remain closed and secured.
 - b. Coordinate with Emergency Services serving the area for Emergency Vehicle Access at all times of the day and night during the course of construction.
 - 4. All fencing shall be lockable and shall be locked nightly.

- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- K. 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.
- L. Temporary Fire Protection and Safety: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses.
 - 1. Comply with the following:
 - a. NFPA 241; manage fire-prevention program.
 - b. California Building Code.
 - c. California Fire Code.
 - d. City of Clovis Fire Standards.
 - 2. Prohibit smoking in construction areas.
 - 3. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 4. 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.
 - 5. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
 - 6. Impairment of Fire Protection Systems: Impairments to any fire protection system shall be in accordance with the California Fire Code, Section 901.

3.5 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 permanent HVAC system to control humidity.
 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.
 - 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 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Owner.
 - c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 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 015639
TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SCOPE

- A. Work included: Provide protection of all existing plants and planted areas indicated to remain as shown on Drawings.

B. Related Work

31 10 00 SITE CLEARING

1.2 PROJECT CONDITIONS

- A. Review: Visit and walk the site with the Owner and Landscape Architect to clarify scope of work and understand project conditions.
- B. Documentation: Confirm location of all plant materials designated on Drawings as "Existing to Remain". Examine existing irrigation system to remain, and report all malfunctioning equipment, to be repaired by Owner. Record all discrepancies and all conditions which threaten existing plantings. Owner shall arrange for correction of detrimental conditions.
- C. Acceptance: Commencing work shall be taken as acceptance by the Contractor of responsibility for the protection of all existing site plantings.

1.3 SUBMITTALS

- A. Provide one (1) digital PDF copy of the following:
 - 1. Shop Drawings: Construction details for protective barriers and barricades are required.
 - 2. Schedule: Watering schedule, where interruption of irrigation systems will exceed one watering period.
 - 3. Record of existing conditions: Provide three (3) copies of video DVD recording of all existing plants to remain. Provide recording that shows all aspects of existing plants to remain.

1.4 DEFINITIONS

- A. Protection: Provide all barriers as required to prevent damage to existing plant materials to remain, including but not limited to protection from mechanical damage, and soil compaction, pollution from all sources, and disruption of environmental support which would result in the loss of vigor of said plantings.
- B. Tree Protection Zone (TPZ) - Drip Line: An imaginary line on the ground around a tree representing its outermost branch tips. All of the area within the drip line of existing trees to remain is to be protected from damage as specified herein, unless otherwise noted.

1.5 SCHEDULING

- A. Construct all protective barriers prior to demolition and selective clearing. See Demolition Plan.
- B. A demolition meeting will be called prior to demolition where the Landscape Architect and Owner will set the extent of barriers.

1.6 WARRANTY

- A. General: Warrant all existing plant materials against decline resulting from damage during construction and for a period of one year.
- B. Exclusions: Damage due to, Acts of God, or neglect by Owner.

1.7 REPLACEMENTS

- A. General: Existing planting to remain which exhibits conditions which are determined as unacceptable due to inadequate protection during construction shall be replaced by Contractor at no expense to Owner.
- B. Quality: Closely match replacements to adjacent specimens of the same species, variety, and cultivar.
- C. Replacement size shall be equal to material being replaced. Contractor shall visit site prior to bidding in order to familiarize himself with possible replacement sizes.
- D. Planting, Maintenance, and Warranty of Replanted Materials: See Landscape Drawing Sheet 24 of 24.
- E. When required replacement of plant material shall be performed within two working weeks of written notice from Owner.
- F. Liquidated damages will be assessed to the Contractor by the Owner for failure to complete the replacement of plant material within allotted time. The amount will be two hundred (200) dollars for each calendar day the work is not completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Fertilizers, Herbicides, and Pest Control as required shall be of best industry standards as approved by the Landscape Architect.

2.2 SAFETY

- A. Provide all reflective signage and/or flashers as required by all codes and ordinances affecting barricaded plantings to remain.

2.3 BARRIERS

- A. Barriers: Six foot (6'-0") tall temporary chain link fence panels with posts and bases as needed to erect a protective barrier around the plant material to remain

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide barriers at the canopy drip line or Tree Protection Zone (TPZ) of all trees and plants designated to remain. Grouping of trees and plants may be enclosed by a single protective fence. Similarly protect turf, groundcover, and shrub areas from construction activities.
- B. The Tree protection Zone (TPZ) shall be as defined in 1.04-B of this specification. Install temporary barriers / fencing located around the TPZ. No soil disturbance is permitted and activities restricted unless otherwise approved. The approved minimum TPZ shall be as defined in 1.04-B of this specification. Refer to images 2.15-1, 2.15-2 and 2.15-3 for fencing layout of TPZ.



IMAGE 2.15-2

• **Type II Tree Protection**

For trees situated within a **narrow planting strip**, only the planting strip shall be enclosed with the required chain link protective fencing in order to keep the sidewalk and street open for public use.(see *Image 2.15-3*)



IMAGE 2.15-1

• **Type I Tree Protection**

The fences shall enclose the entire area under the **canopy dripline or TPZ** of the tree(s) to be saved throughout the life of the project, or until final improvement work within the area is required, typically near the end of the project (see *Images 2.15-1 and 2.15-2*). Parking Areas: If the fencing must be located on paving or sidewalk that will not be demolished, the posts may be supported by an appropriate grade level concrete base.



IMAGE 2.15-3

3.2 OPERATIONS

- A. Storage: Do not store materials or equipment under the branches of all existing trees nor in turf or ground cover areas to remain.
- B. Traffic: Do not operate nor park equipment within the drip line of existing trees to remain. Keep foot traffic out of existing ground cover and turf areas. Protect shrub areas from cross traffic.

- C. Operations: Do not permit burning, temporary or permanent dumping or storage of construction debris within drip line of existing trees to remain. Give written notification to Owner seven (7) working days prior to work event if any construction activity by any contractor threatens to damage existing plants to remain.

3.3 IRRIGATION

- A. One week prior to construction start the Contractor shall install and maintain an automatically controlled water system accessed through existing irrigation system to all existing plantings to remain. System shall be drip type or spray type and be configured to give the appropriate amount of water for each type of plant.
- B. If the irrigation system is disrupted for any reason during construction the Contractor shall restore irrigation within twenty-four (24) hours of disrupted service.

3.4 EXCAVATING AND GRADING

- A. Cut: Do not permit machine excavation within the drip line of existing trees to remain. All such work shall be by hand labor. Do not permit more than two (2) inches of existing soil to be removed within the drip line except as authorized in writing by Landscape Architect.
- B. Fill: Do not permit stockpiling of soil within the drip line of all existing trees nor on existing turf or groundcover areas. Do not permit more than three (3) inches of fill to be placed within the drip line during grading operations without written acceptance by Landscape Architect.

3.5 REPAIR OF DAMAGED MATERIAL

- A. During the course of construction, if roots two inches (2") or larger in diameter are cut, the Contractor shall take the following immediate action to minimize further damage to the plant material.
 - 1. Stop construction activity, inform Owner of damage. Owner will then contact a certified, qualified arborist for inspection. Compensation for the arborist services shall be the contractor's responsibility.
 - 2. If the arborist determines that damage occurred the Contractor will be directed within forty eight (48) hours to perform the following at the contractor's expense:
 - a. Prune all affected roots to provide a clean smooth even cut.
 - b. Prune canopy and branches of plant material to I.S.A. specifications to compensate for root loss.
 - c. Aerate soil to relieve compaction and to improve oxygen exchange to root system.
 - d. Fertilize trees with deep water bore at a rate of one pound of actual nitrogen per 1,000 sq. ft.
 - e. Inject plant hormones (growth stimulator) through irrigation system.
- B. This process shall be implemented within forty eight (48) hours of direction by arborist. Failure to perform repairs within specified time will institute liquidated damages of two hundred (200) dollars for each calendar day by which the completion of repairs is delayed. Compensation for Arborist services shall be the Contractor's responsibility.

- C. The Owner reserves the right to hire a person or persons to perform the repair work in the event the Contractor does not respond in a timely manner. The expense for this work will be billed to the Contractor at no expense to the Owner.

3.6 MAINTENANCE OF EXISTING PLANTING

- A. General: Maintain all existing plantings to remain throughout course of construction and for a period of 90 days concurrent with maintenance period specified on Landscape Drawings Sheet 24 of 24. Standard Horticultural practices shall be provided as deemed necessary by Landscape Architect.
- B. Fertilizers: Do not use complete fertilizers on existing plant materials unless soils test Indicates specific nutrient deficiencies.
- C. At close of construction in each area, remove all protective barriers at the direction of the Landscape Architect. Transport all barrier materials off site at no additional expense to Owner.
- D. Repair all grades and restore all damaged plant materials.

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 Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design 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. Comparable Product Submittal: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Owner's Action: If necessary, Owner will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Owner will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Owner does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with 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," Owner will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Restricted List: Where Specifications include the phrase or similar phrase "provide one of the following," 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 or similar phrase "includes, but are not limited to the following" provide one of the products or products by one of the manufacturers listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 3. Basis of Design: Where Specifications include the phrase "Basis of Design" and names a manufacturer and product, provide the specified or indicated product or a comparable product by one of the other manufacturers named as having comparable products. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of products by an unnamed manufacturer.

- 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.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Owner will consider Contractor's request for a comparable product when the following conditions are satisfied. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of products by an unnamed manufacturer. If the following conditions are not satisfied, Owner may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it 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.
 - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - 5. Samples, if requested.

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 and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- B. Related Requirements:
 - 1. Division 01 Section "Summary" for limits on use of Project site.
 - 2. Division 02 Section "Selective Demolition" for demolition and removal of selected portions of the building.
 - 3. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

- B. Certified Surveys: Submit two copies signed by professional engineer.
- C. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- 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 Owner of locations and details of cutting and await directions from Owner 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 Owner'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 other 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 Owner 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 Owner 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 Owner 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 Owner 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 Owner.

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 Owner. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Owner 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. 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.
- C. Final Property Survey: Engage a professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

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. 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.
- G. 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 Owner.
 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.

- H. 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.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. 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. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section "Summary."
- F. 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.
- G. 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.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. 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 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.
 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.
- I. 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 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 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.

3.9 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."

3.10 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. Disposing of nonhazardous construction waste as required by the City of Clovis Municipal Code Chapter 6.3.1.
- B. Related Requirements:
 - 1. Division 01 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 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials including the following:

1. Demolition Waste:

- a. Asphalt paving.
- b. Concrete.
- c. Concrete reinforcing steel.
- d. Brick.
- e. Concrete masonry units.
- f. Wood studs.
- g. Wood joists.
- h. Plywood and oriented strand board.
- i. Wood paneling.
- j. Wood trim.
- k. Structural and miscellaneous steel.
- l. Rough hardware.
- m. Roofing.
- n. Insulation.
- o. Doors and frames.
- p. Door hardware.
- q. Windows.
- r. Glazing.
- s. Metal studs.
- t. Gypsum board.
- u. Acoustical tile and panels.
- v. Carpet.
- w. Carpet pad.
- x. Demountable partitions.
- y. Equipment.
- z. Cabinets.
- aa. Plumbing fixtures.
- bb. Piping.
- cc. Supports and hangers.
- dd. Valves.
- ee. Sprinklers.
- ff. Mechanical equipment.
- gg. Refrigerants.
- hh. Electrical conduit.
- ii. Copper wiring.
- jj. Lighting fixtures.
- kk. Lamps.
- ll. Ballasts.
- mm. Electrical devices.
- nn. Switchgear and panelboards.
- oo. Transformers.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Wood trim.
- e. Metals.
- f. Roofing.
- g. Insulation.
- h. Carpet and pad.
- i. Gypsum board.
- j. Piping.
- k. Electrical conduit.
- l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days of date established for the Notice to Proceed.

1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste (Form(s) included at the end of this Section). 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.

1. Recycle and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste in accordance with CalGreen Section 5.408.1.1, 5.408.1.2 or 5.408.1.3; or meet a local construction and demolition waste management ordinance whichever is more stringent.
- 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.
- 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. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. 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

- A. General: Develop a waste management plan according to City of Clovis Municipal Code Chapter 6.3.1 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Division 01 Section "Temporary Facilities and Controls."
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. 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 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 00 Special Provisions, Section 96-32 Closing out the Project.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Division 01 Section "Project Record Drawings" for submitting record Drawings.
 - 4. Division 01 Section "Warranties" for submitting final warranty information.
 - 5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 6. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBMITTALS

- A. 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 submittals specified in other Division 01 Sections, including project record drawings, operation and maintenance manuals, warranties, and similar final record information.

3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

1.4 CLOSEOUT PROCEDURES

- A. Procedures Prior to 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.
- B. 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, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner, that must be completed or corrected before certificate will be issued.
 1. Owner's Punch List: During inspection, Owner and 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 Architect.
 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.

- C. Contractor's Cost for Reinspection: Owner will perform one inspection and one reinspection at no additional cost to the Contractor. The expense for the Owner'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 Owner'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.
- D. As-Built Grading Survey: After construction has been completed, submit a written request for the Civil Engineer obtained by the Owner to perform an As-Built Grading Survey as required by City of Clovis. Any additional As-Built Grading Survey required for corrected deficient work or incomplete work will be the responsibility of the Contractor.

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.

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 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 manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- 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 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Operation and Maintenance Manuals: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.
1. Format: Submit operations and maintenance manuals in the following format:
 - a. 3 paper copies and a digital PDF copy. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Owner will return 2 copies.
 2. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Owner will comment on whether general scope and content of manual are acceptable.
 3. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Owner will return copy with comments.
 - a. Correct or modify each manual to comply with Owner's comments. Submit copies of each corrected manual within 15 days of receipt of Owner's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Installer and/or Subcontractor.
 - 7. Name and contact information for Architect.
 - 8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 9. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

- E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.

4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. 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 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

- 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard 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.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."
- G. 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 Special Provisions 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 00 Special Provisions Section 96-30 Sections for specific warranty requirements for the Work in those Sections.
 - 2. Division 02 through 33 Sections for specific warranty requirements for the Work in those Sections.

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 SUBMITTALS

- A. 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 (Contractual Requirements and Technical Specifications).
 - 1. Bind warranties in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - a. Provide a table of contents for the manual indicating specification section and title of warranty.
 - b. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 - c. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 - d. Provide additional copies of each required warranty as necessary for inclusion in each operation and maintenance manual.

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 Drawings.
- B. Related Sections:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. 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:
 - a. Submit one (1) paper-copy set and one (1) digital PDF copy of marked-up record prints.
 - 1) Owner will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - 2. Final Submittal:
 - a. Submit one (1) paper-copy set and one (1) digital PDF copy of marked-up record prints.
 - b. Submit PDF electronic files of scanned Record Drawings and one set of plots from PDF files.
 - c. Print each drawing, whether or not changes and additional information were recorded.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: 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. Maintain one set of marked-up paper copies of Record Prints.
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 Change Directive.
 - k. Changes made following Owner'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. Utilize 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. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Owner 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 Owner 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.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Owner.
 - e. Name of Architect.
 - f. Name of Contractor.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of Record Drawings during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record 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 Owner'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 Owner.

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.
- D. Provide manufacturer's video references for supplemental operation. Provide video recording of demonstration and training sessions.

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, 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 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, Basis of Design, and Commissioning Plan documentations are included by reference for information only.

1.2 SUMMARY

- A. Section Includes:
 - 1. Building commissioning of the following systems:
 - a. HVAC components and equipment, domestic hot water systems, energy management, control systems.
 - b. HVAC system: Interaction of cooling, heating, and comfort delivery systems.
 - c. HVAC Control System: Control hardware and software, sequence of operations, and integration of factory controls.
 - d. Lighting Control System and interface with daylighting.
 - e. Water heater Title 24 compliant.
 - 2. Building commissioning activities and documentation in support of the 2019 California Energy Code and 2019 California Green Building Standards Code - CALGreen.
 - a. Verify that applicable equipment and systems are installed according to the Contract Documents, manufacturer's recommendations, and industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - b. Verify and document proper performance of equipment and systems.
 - c. Verify that Operation and Maintenance documentation is comprehensive and complete.
 - 3. Verify that Owner's operating personnel are adequately trained.
 - 4. Building commissioning is a process for achieving, verifying, and documenting that the performance of the facilities, systems, and assemblies meet defined objectives and criteria. The commissioning process includes specific tasks to be conducted during each phase in order to verify that design, construction, and training meets the Owner's/Architect's design intent.
- B. The Owner, Architect/Engineer, and Commissioning Agent are not responsible for construction means, methods, job safety, or management function related to commissioning on the job site.
- C. Related Work Specified Elsewhere (as applicable):
 - 1. SUBMITTAL PROCEDURES
 - 2. CLOSEOUT PROCEDURES
 - 3. OPERATION AND MAINTENANCE DATA

4. PROJECT RECORD DOCUMENTS
5. PLUMBING - Division 22
6. HVAC/HVAC CONTROLS – Division 23
7. ELECTRICAL

1.3 DEFINITIONS

- A. Acceptance - A formal action, taken by a person with appropriate provider (which may or may not be contractually defined) to declare that some aspect of the Project meets defined requirements; thus permitting subsequent activities to proceed.
- B. Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included.
- C. Checklists - Verification checklists that are developed and used during all phases of the commissioning process to verify that the Owner's project requirements are being achieved. This includes checklists for general verification, plus testing, training, and other specific requirements. Various checklists are prepared by the Commissioning Agent and the contractor to document equipment; system test completion.
- D. Commissioning - Commissioning is a comprehensive and systematic process to verify that the building systems perform as designed to meet the Owner's requirements. Commissioning during- the construction, acceptance, and warranty phases is intended to achieve the following specific objectives:
 1. Verify and document that equipment is installed and started per manufacturer's recommendations; industry accepted minimum standards, and the Contract Documents.
 2. Verify and document that equipment and systems receive complete operational checkout by installing contractors.
 3. Verify and document equipment and system performance.
 4. Verify the completeness of operations and maintenance materials.
 5. Ensure that the Owner's operating personnel are adequately trained on the operation and maintenance of building equipment.The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.
- E. Commissioning Plan - an overall plan developed by the Commissioning Agent that provides the structure, schedule, and coordination planning for the commissioning process.
- F. Control System - A component of environmental, HVAC, security, and fire systems for reporting/monitoring and issuing of commands to/from field devices.
- G. Data Logging - The monitoring and recording of flows, currents, status, pressures, etc., of equipment using stand-alone data recorders separate from the control system or the trending capabilities of control systems.

- H. Deficiency - A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents, does not perform properly or is not complying with the design intent.
- I. Design Intent - A dynamic document that provides the explanation of the ideas, concepts, and criteria that are considered to be very important to the Owner. It is initially the outcome of the programming and conceptual design phases.
- J. Functional Performance Test - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing is not functional testing, in the commissioning sense of the word. Test and balancing primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The Commissioning Agent develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. Functional Performance Tests are performed after pre-functional checklists and startups are complete.
- K. Issues Log - A formal and ongoing record of problems or concerns - and their resolution - that have been raised by members of the commissioning team during the course of the commissioning process.
- L. Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- M. Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.
- N. Non-Compliance - see Deficiency.
- O. Non-Conformance - see Deficiency.
- P. Owner's Design Intent (ODI) - A written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes Project goals, measurable performances criteria, cost considerations benchmarks, success criteria, and supporting information.
- Q. Pre-functional Checklist - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the Commissioning Agent to the contractor. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension,

oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word "pre-functional" refers to before functional testing. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist.

- R. Quality Based Sampling - A process for evaluating a subset (sample) of the total population. The sample is based upon a known or estimated probability distribution of expected values; an assumed statistical distribution based upon data from a similar product, assembly, or system; or a random sampling that has scientific statistical basis.
- S. Seasonal Performance Tests - Functional Performance Test that are deferred until the system(s) will experience conditions closer to their design conditions based on weather conditions.
- T. Simulated Condition - Condition that is created for the purpose of testing the response of a system (e.g.: raising/lowering the set point of a thermostat to see the response of a VAV box).
- U. Startup - The initial starting or activating of dynamic equipment, including completing construction checklists.
- V. System Manual - A system focused composite document that includes the operation manual, maintenance manual, and additional information of use to the Owner during the occupancy and operations phase.
- W. Procedure - A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems. The test procedures are specified in the Technical Specifications sections on the Contract Documents. Performance testing covers the dynamic functions and operations of equipment and systems under full operation. Systems are tested under various models; such as during low cooling loads, high loads, component failures, unoccupied, varying outside air, fire alarm, power failure, etc. The systems are run through all the sequences state.
- X. Training Plan - A written document that details the expectations, schedule, budget, and deliverables of commissioning process activities related to training of project operating and maintenance personnel, users, and occupants.
- Y. Trending - The monitoring by a building management system or other electronic data gathering equipment, and analyzing of the data gathered over a period of time. Trending of all equipment control points is required prior to functional testing.
- Z. Verification - The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project Requirements.
- AA. Warranty Period - Warranty period for the entire project; including equipment components. Warranty begins at Substantial Completion and extends for at least one

year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.4 COORDINATION

- A. Perform commissioning services to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
- B. Commissioning Agent shall provide overall coordination and management of the commissioning program as specified herein.
- C. Commissioning Team: The commissioning process will require cooperation of the Contractor, subcontractors, vendors, installers, Architect/Engineer, Commissioning Agent, and Owner. The commissioning team shall be comprised of the following.
 - 1. Contractor
 - a. Project Manager
 - b. Test Engineer
 - 2. Subcontractors: As appropriate to product or system being commissioned.
 - 3. Commissioning Agent
 - a. Project Manager
 - b. Project Engineers
 - 4. Owner Representative(s)
 - 5. Architect/Engineer
 - a. Architect
 - b. MEP Engineers
 - c. Specialty Consultant(s)
- D. Progress Meetings: Attend construction job-site meetings, as necessary, to monitor construction and commissioning progress. Coordinate with contractor to address coordination, deficiency resolution and planning issues. Plan and coordinate additional meetings as required to progress the work.
- E. Site Observations: Perform site visits, as necessary, to observe component and system installations.
- F. Functional Testing Coordination:
 - 1. Equipment shall not be "temporarily" started for commissioning.
 - 2. Functional performance testing shall not begin until pre-functional, start-up, and test and balancing is completed for a given system.
 - 3. The controls system and equipment it controls shall not be functionally tested until all points have been calibrated and pre-functional checklists are completed.

1.5 QUALITY CONTROL

- A. Qualifications for Commissioning Agents: Engaging commissioning service personnel that specialize in the types of inspections and tests to be performed.
 - 1. Inspection and testing service agencies shall be members of the Building Commissioning Association (BCA).

1.6 SUBMITTALS

- A. Commissioning Agent shall submit the following:
1. Basis of Design and Design Intent.
 - a. Update as necessary during the work to reflect the progress on the components and systems. Forward updates to the Architect/Engineers in a timely manner.
 2. Scoping Meeting Minutes.
 3. Commissioning Plan: Submit within 30 calendar days of authorization to proceed.
 - a. Update as necessary during the work to reflect the progress on the components and systems. Forward updates to the Architect/Engineers in a timely manner.
 4. Commissioning Schedule: Submit with Commissioning Plan.
 - a. Update as necessary during the work to reflect the progress on the components and systems. Forward updates to the Architect/Engineers in a timely manner.
 5. Functional performance test forms: Submit minimum 30 calendar days prior to testing.
 6. Deficiency Report and Resolution Record: Document items of non-compliance in materials, installation or operation. Document the results from start-up/pre-functional checklists, functional performance testing, and short-term diagnostic monitoring. Include details of the components or systems found to be non-compliant with the drawings and specifications. Identify adjustments and alterations required to correct the system operation, and identify who is responsible for making the corrective changes.
 - a. Update as necessary during the work to reflect the progress on the components and systems. Forward updates to the Architect/Engineers in a timely manner.
 7. Final Commissioning Report: Compile a final Commissioning Report. Summarize all of the tasks, findings, conclusions, and recommendations of the commissioning process. Indicate the actual performance of the building systems in reference to the design intent and contract documents. Include completed pre-functional inspection checklists, functional performance testing records, diagnostic monitoring results, identified deficiencies, recommendations, and a summary of commissioning activities.
 8. O&M Submittals:
 - a. Training plan: Training plan shall include for each training session:
 - Dates, start and finish times, and locations;
 - Outline of the information to be presented;
 - Names and qualifications of the presenters;
 - List of texts and other materials required to support training.
 - b. O&M Database.

1.7 RESPONSIBILITIES

- A. The general responsibilities of various parties in the commissioning process are provided in this subsection. The specific responsibilities are in the Technical Specifications.
- B. All Parties:
1. Follow all quality requirements in the Contract Documents.

2. Attend commissioning kickoff meeting and additional coordination meetings as necessary.
- C. Architect (A/E):
- Construction Phase
1. Attend the commissioning coordination meeting and selected commissioning team meetings.
 2. Perform normal submittal review, construction observation, as-built drawing review; O&M manual review, etc., as contracted.
 3. Provide design narrative documentation to Commissioning Agent.
 4. Coordinate resolution of system deficiencies identified during commissioning; according to the Contract Documents.
 5. Review and approve the O&M manuals.
- D. Mechanical and Electrical Engineers (A/E)
- Construction Phase
1. Perform normal submittal review, construction observation, as-built drawing review, etc.; as contracted. One site observation should be completed just prior to system startup.
 2. Provide any design narrative and sequences documentation requested by the Commissioning Agent. The engineers shall assist in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings, or equipment documentation is not sufficient for writing detailed testing procedures.
 3. Attend the commissioning meetings as necessary.
 4. Participate in the resolution of system deficiencies identified during commissioning; according to the Contract Documents.
 5. Review and approve the O&M manuals.
- Occupancy and Operations Phase
- a. Participate in the resolution of non-compliance, non-conformance, and design deficiencies identified during commissioning during warranty period commissioning.
 - b. Attend lessons learned session.
- E. Commissioning Agent: The Commissioning Agent will 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 Owner's Design Intent. When a random sample does not meet the requirement; the Commissioning Agent will report the failure in the "Issues Log".
- Construction Phase
1. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications with all necessary parties, frequently updated timelines and schedules and technical expertise.
 2. Coordinate the commissioning work and; with the General Contractor and Owner/CM, help integrate commissioning activities into the Master Schedule.
 3. Revise the Commissioning Plan as necessary.

4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
5. Request and review additional information requested to perform commissioning tasks; including O&M materials, contractor startup and checkout procedures.
6. Before startup; gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained in writing to be able to write detailed testing procedures.
7. Review and approve contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute construction checklists. Prepare and maintain completed construction checklist log.
9. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitution relating to the commissioning process. Assist in resolving any discrepancies.
10. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
11. Approve construction checklist completion by selected site observation and spot-checking.
12. Recommend approval of systems startup by reviewing startup reports and by selected site observation.
13. Review test and balancing execution plan.
14. Oversee sufficient testing of the HVAC control system.
15. Recommend approval of air and water systems balancing by spot testing by reviewing completed reports and by selected sit observation.
16. With necessary assistance and review from installing contractors; write the performance test procedures for equipment and systems; including energy management control system trending, stand-alone data logger monitoring or manual performance testing.
17. Analyze any performance trend logs and monitoring data to verify performance.
18. Coordinate, witness, and recommend approval of manual performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
19. Maintain a master Issues Log and a testing record. Provide the commissioning team with progress reports, test results, and recommended actions.
20. Witness all or part of all Owner contracted tests or tests by manufacturer's personnel over which the Commissioning Agent may not have direct control. Document these tests and include this documentation in Commissioning Record in O&M manuals.
21. Review equipment warranties to ensure that the owner's responsibilities are clearly defined.
22. Oversee and approve the training of the owner's operating personnel.
23. Complete and maintain a commissioning record and building systems book(s).
24. Review and approve the preparation of the O&M manuals.
25. Provide a final commissioning report.
26. Coordinate the development of a systems manual.

27. Prepare a standard trend logging package of primary parameters that will provide the operations staff clear indications of system function in order to identify proper system operation and trouble shoot problems. The Commissioning Agent shall also provide any needed information on interpreting trends.

Occupancy and Operations Phase

- a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
- b. Return to the Site/Project on or about 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.
- c. Assist in the development of a preventative maintenance plan, a detailed operating plan or an energy and resource management plan or as-built documentation.
- d. Attend and facilitate lessons learned session.

F. Owner or Owner's Representative (CM)

Construction and Acceptance Phase

1. Attend a commissioning coordination meeting and other commissioning team meetings.
2. Perform the normal review of contractor submittals.
3. Furnish a copy of all Construction Documents, Addenda, Change Orders, and approved submittals.
4. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
5. Provide the Owner's Design Intent documentation to the Commissioning Agent and contractor for information and use.
6. Provide the Basis of Design documents; prepared by the Architect and approved by the Owner to the Commissioning Agent and operation and maintenance training plan.
7. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

Occupancy and Operations Phase

- a. Assist the Commissioning Agent as necessary in the seasonal or deferred testing and deficiency correction required by the specifications.
- b. Attend lessons learned session.

G. Owner's Project Manager (PM)

Construction Phase

1. Manage the contract of the Architect/Engineer and the General Contractor.
2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions.
3. Provide final approval for the completion of the commissioning work.

Occupancy and Operations Phase

- a. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.
- b. Attend lessons learned session.

- H. Contractor: Contractor, their subcontractors, and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to the following:

Construction Phase

1. Perform customary quality control on all work performed under this contract.
2. Prepare O&M manuals, as-built drawings, construction observation, etc. according to the Contract Documents; including clarifying and updating the original sequences of operation to as-built/as-tested conditions.
3. Provide startup procedures for all equipment prior to equipment startup/testing.
4. Attend one commissioning coordination meeting at the beginning of construction.
5. Facilitate the commissioning coordination of the commissioning with the construction schedule.
6. Ensure that all subcontractors and vendors execute their installation, testing, and startup responsibilities as defined in this section and the technical specifications.
7. Provide submittals as required elsewhere in the contract including all changes thereto.
8. Participate in intermittent commissioning discussions held during weekly construction meetings.
9. Attend one commissioning meeting to coordinate equipment functional testing approximately 60 days prior to startup of the first piece of major equipment. Meeting will be chaired by the Commissioning Agent and may include various owner representatives including the CM, A/E, and PM.
10. Provide training of owner personnel as identified in contract specifications.
11. Provide trend logs and trend reports of all equipment control points to aid in demonstration of proper control sequence of operations prior to functional testing.

Occupancy and Operations Phase

- a. Ensure that subcontractors complete all quality requirements identified in the contract specifications.
- b. Ensure that subcontractors correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings as the project progresses.
- c. Perform all guarantee work for materials furnished under the contract for the time specified in the contract; including all warranties and curing all latent defects within the time period provided in the contract.

- I. Vendors/Subcontractors

1. Analyze specified products and verify that the A/E has specified the newest, most current equipment reasonable for this project's scope and budget.
2. Provide requested information regarding equipment sequence of operation and testing procedures as required in contract specifications.
3. Provide copy of all quality assurance test results/reports for equipment installed by factory representatives.

PART 2 – PRODUCTS

2.1 TEST EQUIPMENT

- A. Instrumentation shall meet the following standards:
 - 1. Be of sufficient quality and accuracy to test and measure system performance within the tolerances required to determine adequate performance.
 - 2. Be calibrated on the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument being used.
 - 3. Be maintained in good repair and operation condition throughout the duration of use on this project.
- B. All standard testing equipment required to perform startup, initial system checkout, and required functional performance testing shall be provided by the contractor for the equipment being tested. Any specialized testing equipment not required to perform contract work will be provided by the Commissioning Agent.
- C. Data logging equipment or software required to test equipment will be provided by the Commissioning Agent, but shall not become the property of the Owner.

2.2 COMMISSIONING PLAN

- A. The Commissioning Agent is to develop a Commissioning Plan identifying the quality assurance processes to be implemented by the Owner. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.
 - 1. Commissioning during construction begins with an initial commissioning meeting conducted by the Commissioning Agent where the commissioning process is reviewed the project commissioning team members.
 - 2. Additional meetings will be required throughout construction; scheduled by the Commissioning Agent through the Owner or CM with necessary parties attending to plan, scope, coordinate, schedule future activities and resolve problems.
 - 3. Equipment documentation is submitted to the Commissioning Agent through the Owner or CM during the normal submittal process; including detailed startup procedures.
 - 4. The pre-functional checklists are to be completed by the contractor prior to startup to demonstrate equipment is ready for startup.
 - 5. Pre-functional checklists, equipment startup, trend logging and reporting, and test and balancing must be completed before functional performance testing.
 - 6. Items of non-compliance in material, installation, or setup shall be corrected at no expense to the Owner.
 - 7. The contractor ensures that the subcontractors' construction checklists are executed and documented and that startup and initial checkout are performed. The Commissioning Agent approving test and balancing, and checklists and startup plans. This also includes witnessing startup of selected equipment. Any testing failure is to be corrected at no additional cost to the Owner, and a re-test is to be performed, observed, and documented.
 - 8. The Commissioning Agent develops and implements equipment and system performance test procedures. These procedures are approved by the Owner and CM.

9. The performance tests are executed by the contractor under the direction of the Commissioning Agent with the assistance of the facility staff. All documentation is by the Commissioning Agent.
10. The Commissioning Agent reviews the O&M documentation for completeness and provides the commissioning record for the O&M manuals.
11. Commissioning is to be completed before substantial completion.
12. The Commissioning Agent assists in the development and reviews and pre-approves the training program provided by the contractor.
13. Deferred testing is conducted as specified or required.

2.3 EQUIPMENT / SYSTEMS TO BE COMMISSIONED

- A. The following equipment /systems will be commissioned in this Project:
 1. Domestic water system - plumbing (Level 3)
 2. HVAC ductwork and distribution system (Level 4)
 3. HVAC equipment (Level 4)
 4. HVAC instrumentation (Level 4)
 5. HVAC test and balance (Level 5)
 6. Interior and Exterior Lighting and Controls (Level 3)
 7. Landscape irrigation controller (Level 3)

Note: Levels defined in 3.4 PERFORMANCE TESTING AND VERIFICATION

PART 3 – EXECUTION

3.1 MEETINGS

- A. Commissioning Coordination Meeting - Within 60 days of the Notice to Proceed (NTP), the Commissioning Agent, through the Owner/CM, will schedule, plan, and conduct an initial commissioning meeting. The contractor and its responsible parties previously identified shall attend.
- B. Commissioning Agenda Discussions - At various times during the course of construction, commission related agenda will be discussed during the weekly project meetings along with other quality related discussions. These discussions will be held weekly during the final 3 months of construction.
- C. Functional Testing Meetings - Prior to HVAC equipment startup a commissioning meeting will be conducted to coordinate commissioning activities with equipment startup and testing.

3.2 COMMISSIONING PROCESS

- A. The following activities outline the commissioning tasks and the general order in which they occur.
 1. The Commissioning Agent shall coordinate all activities.
 - a. Design Review and Documentation.
 - b. Documentation of Basis of Design and Design Intent.
 - c. Design Development Review.
 2. Construction Document Review.
 3. Commissioning Scoping Meeting.
 4. Commissioning Plan.

5. Submittals Review.
6. Start-Up/Pre-Functional Checklists.
7. Functional Performance Testing.
8. Short-Term Diagnostic Testing.
9. Deficiency Report and Resolution Record.
10. Operations and Maintenance Training.
 - a. O&M Manual.
 - b. Training.
 - c. O&M Database.
11. Record Documents Review.
12. Final Commissioning Report and Documentation.
13. Deferred Testing.
 - a. Unforeseen Deferred Tests.
 - b. Seasonal Testing.
 - c. End-of-Warranty Review.

3.3 SUBMITTALS

- A. The Commissioning Agent will provide appropriate contractors with a specific request for the type of submittal documentation the Commissioning Agent requires facilitating the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum; the request will include the manufacturer and model number, the manufacturer's printed installation and detailed startup procedures, full sequence of operation, O&M data, performance test procedures, trend data, and logs/reports, control drawings, and details of owner contracted tests. In addition; the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the commissioning agent All documentation requested by the Commissioning Agent will be included by the subcontractors in their O&M manual contributions.
- B. The Commissioning Agent will review and approve submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the performance of the equipment, and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance and only secondarily to verify compliance with equipment specifications. The commissioning agent will notify the Owner/CM of items missing or areas that are not in conformance with Contract Documents and which require resubmission.
- C. The Commissioning Agent may request additional design narrative from the NE and controls contractor, depending on the completeness of the Owner's Design Intent documentation and sequences provided with the plans and specifications.
- D. These submittals to the Commissioning Agent do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the contractor; though the Commissioning Agent will review and approve them.

3.4 PERFORMANCE TESTING AND VERIFICATION

- A. Requirements - All systems shall be performance tested and verified to demonstrate that each is operating according to the documented design intent and contract documents. Performance testing facilitating bringing the systems from a state of individual equipment level completion to full dynamic system operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
1. Level 1 - The Commissioning Agent will periodically observe and inspect the installation of the building systems and may review project documentation to verify operational requirements meet the ODI.
 2. Level 2 - The Commissioning Agent will perform Level 1 activities and review inspection reports, test reports, and project deficiency lists prepared by others to verify operational requirements are met.
 3. Level 3 - The Commissioning Agent will perform Level 2 activities and inspect, witness testing, and/or operations of the system to verify operational requirements are met. These activities will be performed independently of the contractor.
 4. Level 4 - The Commissioning Agent will perform Level 2 activities and will witness contractor performance testing of the system. Contractor shall test up to 20% of the system to prove operational requirements are met. The test sections shall be chosen at random by the Commissioning Agent to ensure uniformity of the system. Failure of any test section shall require retesting of that section and an additional test section equivalent in scope. Coordination will be required to avoid impact to the construction schedule.
 5. Level 5 - The Commissioning Agent will perform Level 2 activities and will witness contractor performance testing of the system. Contractor shall test up to 100% of the system to prove operational requirements are met. Failure of any test section shall require retesting of that section. Coordination will be required to avoid impact to the construction schedule.
- B. Coordination and Scheduling - The contractor shall provide sufficient notice regarding their completion schedule for the pre-functional checklists, startup of all equipment, test and balancing, and controls systems completion to allow the performance verification to be scheduled. The commissioning team shall oversee, witness, and document the performance of all equipment and systems. The Commissioning Agent in association with the contractor/subcontractors and facility staff shall execute the tests. Performance verification testing shall be conducted only after the contractor has documented the systems are complete and operational; meeting contract requirements. The control system shall be sufficiently tested and approved by the Commissioning Agent before it is used and trend data/logs and reports provided to verify performance of all components or systems. The air and water balancing shall be completed before performance testing of air or water related equipment or systems. Testing proceeds from components to sub-systems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems shall be checked.
- C. Development of Test Procedures - Before test procedures are finalized; the contractor shall provide the A/E and the Commissioning Agent all requested documentation and a current list of changes affecting equipment or systems; program code, control sequences, and testing parameters. Using the testing parameters and requirements in the technical specifications, the Commissioning Agent shall update/develop specific test procedures and forms to verify and document proper operation of each piece of

equipment and system. Each contractor/subcontractor or vendor, as appropriate, shall provide assistance to the Commissioning Agent in developing the final procedures. Prior to finalization, the A/E shall review and concur with the test procedure.

D. Test Methods

1. Performance testing and verification may be achieved by manual testing or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The Commissioning Agent may substitute specified methods or require an additional method to be executed other than what was specified, with the approval of the Owner/CM. The Commissioning Agent will determine which method is most appropriate for tests that do not have a specified method.
2. Simulated Conditions - Simulating conditions shall be allowed; though timing the testing to experience actual conditions is encouraged whenever practical.
3. Overridden Values - Overriding sensor values to simulate a condition; such as overriding the outside air temperature reading in a control system to be something other than it really is, is acceptable.
4. Simulated Signals - Using a signal generator which creates a simulated signal to test and calibrate transducers and direct digital control constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overridden values.
5. Altering Setpoints - Rather than overriding sensor values; and when simulating conditions is difficult, altering Setpoints to test a sequence is acceptable.
6. Indirect Indicators - Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the test parameters, that the indirect readings through the control system represent actual conditions and responses.
7. Setup - Each performance test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The contractor/subcontractor(s) assisting the Commissioning Agent in executing the test shall provide all necessary materials, system modifications, etc., to produce the necessary flows, pressures, temperatures, etc., necessary to execute the test according to the specified conditions. At completion of the test, the contractor/subcontractor(s) shall return all affected equipment and systems to their approved operating settings.

- E. Problem Solving - The burden of responsibility to solve, correct, and retest malfunctions/failures is with the contractor.

3.5 DOCUMENTATION, NON-CONFORMANCE, AND APPROVAL OF TESTS

- A. Documentation - The Commissioning Agent shall witness and verify/pre-approve the documentation of the results of all functional performance tests.
- B. Non-Conformance
1. Corrections of minor deficiencies identified may be made during the tests at the discretion of the Commissioning Agent. In such cases the deficiency and resolution will be documented on the procedure form or on an attached sheet.
 2. Cost of retesting a performance test shall be borne by the contractor.
 3. The contractor shall submit in writing to the CM at least as often as commissioning meetings are being scheduled. The status of each outstanding

discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.

- a. The Commissioning Agent retains the original non-conformance forms until the end of the project.
 - b. Retesting shall not be considered a justified reason for a claim of delay or for a time extension by the contractor.
- C. Approval - The Commissioning Agent notes each satisfactory demonstrated function on the test form. Final approval of the performance test by the Owner is made after review by the Commissioning Agent.

3.6 DEFERRED TESTING

- A. Unforeseen Deferred Tests: If a test cannot be completed due to the building structure, required occupancy condition, or other deficiency, the functional testing may be delayed upon recommendation of the Commissioning Agent and the approval of the Owner. These tests are conducted in the same manner as the seasonal tests as soon as possible.
- B. Seasonal Testing:
1. Schedule, coordinate, observe, and document additional testing for seasonal variation in operations and control strategies during the opposite season to verify performance of the HVAC system and controls. Complete testing during the warranty period to fully test all sequences of operation.
 2. Update O&M manuals and Record Documents (As Built Drawings) as necessary due to the testing.
- C. End-of-Warranty Review: Conduct end of warranty review prior to the end of the warranty period. Review the current building operation with the facility maintenance staff. The review shall include outstanding issues from original or seasonal testing. Interview facility staff to identify concerns they may have with building operation. Provide suggestions for improvements and assist owner in developing reports or documentation to remedy problems.
1. Update O&M manuals and Record Documents (As Built Drawings) as necessary due to the testing.

3.7 SYSTEMS MANUAL / OPERATIONS AND MAINTENANCE MANUALS / DATA

- A. Commissioning Record and O&M Manuals.
1. The Commissioning Agent will prepare a Systems Manual documenting the commissioning process and identifying operational requirements and parameters for future retesting. The systems manual will include:
 - a. O&M manuals prepared by the General Contractor.
 - b. The Commissioning Plan.
 - c. System reports including design narratives and criteria including sequences. Each system shall contain the startup plan and report, approvals, corrections, construction checklists, completed performance tests, trending and analysis, training plan, and recommended recommissioning schedule.
 - d. Final Commissioning Report including an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope, and a general description of testing and verification

methods. For each piece of commissioned equipment, the report should contain the disposition of the Commissioning Agent regarding the adequacy of the equipment, documentation, and training meeting the contract Documents in the following areas: 1) equipment meeting the equipment specifications, 2) equipment installation, 3) performance and efficiency, 4) equipment documentation and design intent, and 5) operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc., shall also be listed. Each non-compliance issue shall be referenced to the specific performance test, inspection, trend log, etc. where the deficiency is documented. The performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, Building Automation System trend logs, data loggers, etc.) and include observations and conclusions from the testing.

3.8 TRAINING OF OWNER PERSONNEL

- A. The contractor shall provide training coordination, scheduling of subcontractors, and ensure that training is completed. All training shall be coordinated through the CM with the Commissioning Agent.
- B. The contractor shall ensure that each subcontractor and vendor (mechanical, plumbing, fire, electrical, specialty, etc.) shall have the following responsibilities:
 - 1. Provide to the Commissioning Agent through the CM a training plan sixty (60) days before the planned training covering the following elements:
 - a. Equipment
 - b. Intended audience
 - c. Location of training
 - d. Objectives
 - e. Subject covered (description, duration of discussion, special methods, etc.)
 - f. Duration of training on each subject
 - g. Instructor for each subject
 - h. Methods (classroom lecture, manufacturer's quality video, site walk-through, actual operational demonstrations, written handouts, etc.)
 - 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment that makes up the system.
 - 3. Training shall normally start with classroom sessions followed by hands-on demonstration/training on each piece of equipment.

END OF SECTION

SECTION 02 30 00
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:

Krazan and Associates
215 West Dakota Avenue
Clovis, California, 93612
Phone: (559) 348-2200

Report Number: 012-15087
- B. A copy of the Geotechnical Investigation Report is contained in the Appendix of this Project Manual (Contractual Requirements and Technical Specifications).
- 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 02 41 09
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 portions of building or structure.
- 2. Demolition and removal of selected site elements.
- 3. Salvage of existing items to be reused 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 "Execution" for cutting and patching procedures.
- 3. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and salvaged for reinstallation.
- B. Remove and Salvage: Detach item from existing construction, and deliver them to Owner. Items to be salvaged shall be removed without damage to the item.
- C. Remove and Salvage for Reinstallation: Detach item from existing construction, prepare for reuse, and securely store item until it is to be reinstalled at locations indicated. Items to be salvaged shall be removed without damage to the item.
- D. Existing to Remain: Existing items of construction that are not to be removed.

1.4 SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property 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: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- D. Predemolition Photographs: Submit before Work begins.
- E. 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.
- F. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.
- G. Inventory: Submit a list of items that have been removed and salvaged.

1.5 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. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Predemolition 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.

1.6 PROJECT 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 not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
- E. Storage or sale of removed items or materials on-site is not permitted.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 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 "Construction Facilities and Temporary 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.
- C. Temporary Shoring: 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.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and 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. 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.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 5. Dispose of demolished items and materials promptly.
- B. Removed and Salvaged Items:
 - 1. Clean salvaged items.

- a. Items to be removed and salvaged for reinstallation shall be cleaned and repaired to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner or reinstallation.
 4. Protect items from damage during transport and storage.
 5. Items salvaged to Owner shall be delivered to the appropriate City of Clovis yard as directed by the City Inspector.
 6. Items to be reinstalled shall be installed 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.
- C. 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.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. 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.
- B. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
1. Remove residual adhesive and prepare substrate in accordance with flooring manufacturer's written recommendations.
- C. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
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.

- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 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 03 10 00
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in-place concrete with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.
- E. Related Sections
 - 1. Section 03 20 00 Concrete Reinforcement.
 - 2. Section 03 30 00 Cast-In Place Concrete.
 - 3. Section 03 39 00, Concrete Curing.

1.02 REFERENCES

- A. ACI 117 - Standard Tolerances for Concrete Construction and Materials.
- B. ACI 318-14 - Building Code Requirements for Structural Concrete.
- C. PS-1 - Construction and Industrial Plywood.
- D. California Code of Regulations, Title 8 Subchapter 4. Construction Safety Orders, Article 29, Erection and Construction, Section 1717.
- E. Chapter 19, 2019 California Building Code.
- F. APA - American Plywood Association Design and Construction Guide.
- G. Local AQMD - Air Quality Management District.

1.03 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to ACI 318 Section 26.11. Resultant concrete to conform to required shape, line and dimension. Design of formwork is Contractor's responsibility.
- B. The formwork shall be designed for the loads and lateral pressures outlined in Chapter 2 of ACI 347R, and lateral forces as specified by the CBC.
- C. Above grade forms for elevated slabs and for walls exceeding 4 ft. in height shall be designed by a professional Civil or Structural engineer registered in the State of California.

- D. Foundation concrete may be placed directly into neat excavations, provided foundation trench walls are sufficiently stable subject to approval of DSA. Otherwise, minimum formwork is mandatory to insure clean excavations and properly formed surfaces immediately prior to and during placing of concrete.

1.04 COORDINATION

- A. Coordinate this Section with other Sections of work that require attachment of components to formwork.
- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, Contractor shall adjust reinforcement positioning to accomplish required cover or otherwise request instructions from Architect before proceeding.

1.05 SUBMITTALS

- A. Submit specification for type of form material to use for each exposed surface to be formed.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Plywood: APA - MDO (Medium Density Overlay) Plyform, Group 1, Exterior, PS-1, for exposed surfaces. APA - BB (No-overlay) Plyform, Class 1, Exterior, PS-1 for unexposed surfaces.
- B. Lumber: Douglas Fir species; construction grade with grade stamp clearly visible.

2.02 FORMWORK ACCESSORIES

- A. Form Release Agent: Colorless non-staining liquid chemical agent, free of wax or oils which will not absorb water. Material shall comply with AQMD, Local Regulations.
- B. Corners: Chamfered type; maximum possible lengths.
- C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

3.02 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements in accordance with requirements of ACI 318 Section 26.11.

1. Where public areas such as sidewalks and streets are to be shored, drawings and calculations are to be submitted by Contractor to the city or governing agency for approval prior to beginning of any work.
 2. Contractor and/or his engineer assume and accept all responsibility for construction and safety of formwork and shoring.
 3. Upon completion of Work, formwork and shoring materials are to be removed from site at expense of Contractor. Certain steel and/or concrete materials may be left in place with written approval of Architect.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shoring. Conform to Title 8, Subchapter 4, Construction Safety Orders, CCR.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members that are not indicated on Drawings.
- F. Provide chamfer strips on external corners.
- G. Surface irregularities, ACI 347R Class A, gradual or abrupt irregularities of 1/8 inch for exposed to view concrete. Class B, 1/4 inch for plaster cement finish.
- 3.03 APPLICATION - FORM RELEASE AGENT
- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.
- 3.04 INSERTS, EMBEDDED PARTS AND OPENINGS
- A. Provide formed openings where required for items to be embedded in or passing through concrete work. No openings or embedded items permitted in structural slabs within 18 inches of columns. Conform to ACI 318 Section 26.11.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate work of other Sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors and other inserts, whether indicated on the structural drawings or not.
- D. Install accessories in accordance with manufacturer's instructions, straight, level and plumb. Ensure items are not disturbed during concrete placement.

- E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- F. Close temporary openings with tight fitting panels, flush with inside face of forms and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.05 FORM CLEANING

- A. Clean and remove foreign matter within forms as erection proceeds.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.06 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117.

3.07 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design and that supports, fastenings, wedges, ties and items are secure.

3.08 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads. Conform to ACI 318 Section 26.11.2.
 - 1. Minimum stripping time for edges of slabs and footings: 3 days.
- B. Loosen forms carefully. Do not wedge pry bars, hammers or tools against finish concrete surfaces scheduled for exposure to view. Do not break-off corners.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms. Re-shoring permitted only after 10 days from stripping.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fabricating and setting reinforcing steel and accessories for cast-in-place concrete.
- B. Related Sections:
 - 1. Section 03 10 00, Concrete Formwork
 - 2. Section 03 30 00, Concrete

1.02 REFERENCES

- A. ACI 315 - Details and Detailing of Concrete Reinforcing.
- B. ACI 318-14 - Building Code Requirements for Structural Concrete and Commentary.
- C. ASTM A1064 – Standard Specification for Carbon-steel Wire and Welded Wire Reinforcement, Plain and Deformed, for concrete.
- D. ASTM A615 - Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- E. ASTM A706 - Specification for Deformed and Plain Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- F. CRSI - Concrete Reinforcing Steel Institute Manual of Practice.
- G. Chapter 19, 2019 California Building Code.

1.03 SUBMITTALS

- A. Shop Drawings, indicating bar sizes, spacings, locations and quantities of reinforcing steel bending and cutting schedules and supporting and spacing devices.

1.04 QUALITY ASSURANCE

- A. Provide Testing Laboratory with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.
- B. Comply with the requirements of Division 01 General Requirements.

1.05 COORDINATION

- A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 - PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, deformed billet steel bars, in grades as follows, and conforming to ACI 318 Chapter 20 and Section 26.6.
 - 1. For No.4 and larger bars, use 60 ksi yield grade.
 - 2. For ties and stirrups, and No. 3 and smaller bars, use 40 or 60 ksi yield grade.
- B. Welded Wire Reinforcement: Plain type, ASTM A1064; in flat sheets; uncoated finish, 6 x 6 - W4.0 x W4.0 unless otherwise noted on drawings.

2.02 ACCESSORY MATERIALS

- A. Tie Wire: Minimum 16 gauge black annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.
- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.
- D. Concrete Blocks: Approximately 3 inches dimension each side.

2.03 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice and ACI 315 and ACI 318. Wherever possible, make bends to shape in fabricator's shop.
 - 1. Bars reduced in section will not be accepted.
 - 2. Bars with kinks are unacceptable.
 - 3. Bars shall not be heated to facilitate bending or for any other purpose.
 - 4. Bars with bends not indicated on drawings will not be accepted. Perform no forming in a manner which will damage bars.
 - 5. Re-bending of bars prohibited.
- B. Locate reinforcing splices not indicated on Drawings at point of minimum stress.

PART 3 - EXECUTION

3.01 PLACEMENT

- A. General: Comply with CBC and CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Place, support and secure reinforcement against displacement. Do not deviate from required position. Install concrete blocks to support reinforcement over grade. Rocks not permitted.

- C. Do not displace or damage vapor barrier where vapor barrier is specified or indicated on drawings. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- D. Accommodate placement of formed openings.
- E. Prior to placing, thoroughly clean reinforcement of all rust, dirt, dust, oil or any other material deleterious to bonding of concrete.
- F. Accurately place and securely tie reinforcement with black annealed wire and securely hold in position during placing of concrete by means of precast concrete block supports. Point wire tie ends away from the form. Unless otherwise indicated, the number, type, and spacing of supports shall conform to the ACI 315.
 - 1. Tie reinforcement splices and intersections per CBC and CRSI, Chapter 10- General Principles for Placing, Splicing and Tying Reinforcing Bars.
- G. During placing of structural concrete slabs, provide a full-time reinforcing steel placer to repair and replace reinforcing to its proper location. Provide additional chairs of the proper size available to place under bars displaced during the concrete pouring operation.
- H. Dowels for Walls: Securely tie in place prior to placing of concrete. Do not place dowels in concrete after pour.
- I. Conform to ACI 318-14 Section 20.6.1.3.1, and Structural Drawings for concrete cover over reinforcement. Where conflicts occur between the referenced documents, the more stringent shall apply.
 - 1. Where fire protective cover is specified exceeding the ACI and structural drawing specification, the fire protective cover shall apply.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place concrete.
- B. Concrete slabs on grade, footings and curbs for walls.
- C. Concrete over structural metal composite floor deck.
- D. Control, expansion and contraction joint devices associated with concrete work including joint sealants.
- E. Related Sections
 - 1. Section 03 10 00, Concrete Formwork
 - 2. Section 03 20 00, Concrete Reinforcement
 - 3. Section 03 39 00, Concrete Curing
 - 4. Section 32 13 13, Sitework Concrete
 - 5. Section 07 26 16, Underslab Vapor Barrier

1.02 REFERENCES

- A. CBC - 2019 California Building Code
 - 1. Chapter 19, Concrete
- B. ADA - Americans with Disabilities Act of 1990
- C. ADA/Standards - ADA Title II Regulations and the DOJ/Standards for Accessible Design
- D. ACI 301 - Structural Concrete for Buildings.
- E. ACI 318-2014 - Building Code Requirements for Structural Concrete and Commentary.
 - 1. ASTM C33 - Concrete Aggregate.
 - 2. ASTM C150 - Portland Cement.
- F. ASTM C171 - Sheet Materials for Curing Concrete.
- G. ASTM C1107 - Packaged Dry, Hydraulic - Cement Grout (Nonshrink).
- H. ASTM C1116 - Specification for Fiber-Reinforced Concrete.

- I. ASTM D1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Bituminous Type).
- J. ASTM E96 - Water Vapor Transmission of Materials.
- K. CSS - Caltrans Standard Specifications, Latest Edition.

1.03 SUBMITTALS

- A. Placement Schedule: Submit for approval details and/or sketches showing location of each proposed construction joint. Do not deviate from locations of horizontal joints indicated on drawings.
- B. Product data for each type of manufactured material and product included.
- C. Design mix for each concrete mix.
- C. Steel reinforcement shop drawings, including material, grade bar schedules, spacing, bent bar diagrams, arrangement and supports.
- D. Submit contraction (crack control) joint, expansion, isolation and construction joint layout to Architect for approval.

1.04 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of embedded utilities and components that are concealed from view.
- B. Maintain an accurate record showing date and time of concrete placement in each portion of structure. Correlate placing record for test cylinders made by testing laboratory. Maintain a separate record giving date of removal of forms, shoring, including first and second halves and reshoring, if used. Keep records available for inspection at site. Upon completion, deliver two copies of each to Architect in approved form.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with Section 1905, California Building Code, and ACI 318.1 and 318.3.
- B. Maintain one copy of all records.
- C. Acquire cement and aggregate from same source for all work.
- D. Conform to ACI Chapter 26.5.5 when concreting during hot weather. No concrete placement permitted above 90 degrees Fahrenheit. Limit concrete temperature to 95 degrees Fahrenheit.
- E. Conform to ACI Chapter 26.5.4 when concreting during cold weather. No concrete placement permitted below 50 degrees Fahrenheit or as otherwise specified by ACI 301 based on the size of the section being poured..

1.06 COORDINATION

- A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type II. Portland Cement Type, conforming to Section 1903A, California Building Code.
- B. Aggregates:
 - 1. Aggregate for Stone Concrete: ASTM C33.
 - 2. Aggregate for Lightweight Concrete: ASTM C330.
- C. Conform to requirements on structural drawings for maximum size of aggregate permitted in individual applications.
- D. Water: Clear, from potable source, and not detrimental to concrete.

2.02 ACCESSORIES

- A. Curing Film: Refer to Section 03 39 00, 2.01 A.
- B. Non-Shrink Grout: ASTM C1107, Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 24 hours and 8,000 psi in 7 days; of consistency suitable for application and a 30 minute working time.
- C. Vapor Barrier at interior slabs: Refer to Section 07 26 16.
- D. Reinforcement: In accordance with Section 03 20 00.
- E. Concrete Formwork: In accordance with Section 03 10 00.

2.03 JOINT DEVICES AND FILLER MATERIALS

- A. Expansion Joint Filler - ASTM D1751: Where specified at interior locations provide closed cell bituminous saturated fiberboard, 1/2 inch thick; Fiber Expansion Joint manufactured by American Highway Technology, Kankakee, IL, W. R. Meadows, or approved equal.
- B. Joint Backing: ASTM C1330, Cylindrical, Type C, closed cell, polyethylene backer rod; oversized 30 to 50 percent larger than joint width. Green Rod by Nomaco Inc. or equal.
- C. Saw-Cut Joint Filler: Two-component epoxy resin, gray color, non-hardening, self-leveling, SIKADUR 51 (SL), by Sikacorp., Lyndhurst, NJ, or equal as approved in accordance with Division 01 General Requirements for Substitutions.

2.04 CONCRETE MIX

- A. Mix and deliver concrete in accordance with Section 1905, California Building Code.
- B. Deliver concrete in transit mixers only. Discharge loads in less than 1-1/2 hours after water is first added.
 - 1. Design Mix: ACI 318 Chapter 26. Ingredients and proportions for design mix shall be selected by a DSA-approved Testing Laboratory certified by a registered civil engineer licensed in California in conformance with the limitations specified on the structural drawings, unless otherwise approved under the Substitution Request submittal procedures of this Specification.
 - 2. Required Strength: As noted on the structural drawings.
 - 3. Select proportions by volume for concrete in accordance with the approved design mix.
 - 4. All mix designs for this project to be installed in areas to receive moisture sensitive flooring, as specified in the Architect's documents, shall include a 15% flyash substitute for cement by volume. Class "C" flyash is not permitted.
 - 5. Do not exceed water-cement ratios by weight for concrete items as specified on the structural drawings.
 - 6. Comply with structural drawings for other limitations to each mix design specified.
 - 7. Miscellaneous Sitework Concrete: Specified in Section 32 13 13, Sitework Concrete.

2.05 GROUT MIX

- A. 1:3:2 parts Portland Cement, to sand, to pea gravel, at minimum 2000 psi at 28 days.

2.06 DRYPACK

- A. Cement/sand mix of consistency to pack dry below base plates and other components as specified. Minimum 5,000 psi.
- B. Alternate flowable cementitious fill material may be used if properly dammed and consolidated below components. Minimum 5,000 psi.

2.07 GRANULAR FILL

- A. Crushed Aggregate Base (capillary break): 3/4 inch maximum grading, crushed rock and rock dust conforming to requirements of Section 200-2.2, SSPWC, with 3/8 inch sieve requirement waived, or Class 2 Aggregate Base as defined in Section 26, CSS.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify site conditions.
- B. Verify compaction has been completed per specifications.
- C. Verify requirements for concrete cover over reinforcement.

- D. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely and will not cause hardship in placing concrete.

3.02 PREPARATION

- A. Prepare previously placed concrete by cleaning with sandblasting to remove laitance and expose clean aggregate.
- B. In locations where new concrete is doweled to existing work, drill and clean holes in existing concrete in accordance with the ICC ESR report specified on the structural drawings for the type of epoxy indicated. All non-structural epoxy dowel applications require IOR inspection during installation. All structural epoxy dowel applications will be subject to "special inspection and testing" at Structural Engineer's direction.
- C. When approved by the Architect, clean previously placed concrete with steel brush and apply bonding agent in accordance with manufacturer's instructions.
- D. Under Interior Slabs on Grade: Refer to Geotechnical Reports. Install 3 inches thick crushed aggregate base per Section 200-2.2, SSPWC or Class 2 CCS as capillary break. Over aggregate base place vapor barrier in largest practical sections. Seal all 6-inch lapped seams, penetrations and foundation perimeters using manufacturer-approved tape only and install per manufacturer instructions. Install pipe boots at pipe penetrations. Install reinforcement and concrete as scheduled. To aid in concrete curing an optional 2 to 4 inches of granular fill may be placed on top of vapor barrier. 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. The granular fill material should be compacted.
- E. Install steel reinforcing per Section 03 20 00.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI 318 Section 26.5.2. Remove loose dirt from excavations.
- B. Notify Architect minimum 24 hours prior to commencement of operations. All excavations, forms and reinforcing shall be inspected and approved by the "special inspector" and Architect prior to placement.
- C. Ensure reinforcement, inserts, embedded parts, formed joint fillers, joint devices and accessories are not disturbed during concrete placement.
- D. Install joint fillers, primer and sealant in accordance with manufacturer's instructions.
- E. When detailed on the drawings, separate slabs on grade from vertical surfaces with 1/2 inch thick joint filler.
- F. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface using two-component polyurethane sealant as specified in Section 07 92 00.

- G. Install joint devices in accordance with manufacturer's instructions as detailed.
- H. Install construction joint device in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- I. Maintain joint device in correct position to allow joint cover flush with finish. J. Install joint covers in longest practical length.
- J. Place concrete continuously between predetermined expansion, control and construction joints.
 - 1. Install expansion joints at vertical concrete walls at 24 feet on center unless noted otherwise on drawings.
 - 2. Retaining Walls at Buildings: install waterstops in expansion joints to form a continuous waterproofed wall surface condition. Support and protect exposed waterstops during progress of the Work.
- K. Do not interrupt successive placement; do not permit cold joints to occur.
- L. Avoid segregation of materials. Perform vibrating so as to produce a dense, smooth application free of rock pockets and voids. Do not use vibrators to move concrete horizontally.
- M. Provide special mix prepared by the Testing Laboratory and approved by the Architect utilizing smaller aggregates in areas of reinforcing congestion to prevent the formation of rock pockets.
- N. The unconfined vertical drop of concrete shall not be greater than 5 feet. Do not allow concrete to fall free from any height that will cause materials to segregate. Maximum height of free fall permitted in any case: 5 feet. Utilize trunks or additional chutes where doubt occurs. Conform to requirements of ACI 318 Section 5.10.
- O. Horizontal Construction Joints: Wash surface of each joint shortly after pouring to expose clean, sound aggregate. Sandblast surface to remove laitance remaining or loose aggregate as approved by the Architect. Conform to ACI 318 Section 5.7.
- P. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/8 inch in 10 ft. Slope floors for drains.
- Q. Exterior Slab Contraction Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch, place joints at column lines and at 12 ft. o.c. each way, maximum. Remove groover tool marks on exposed concrete surfaces. Contractor's option: Saw cut joints, early-entry dry-cut, per ACI 302.1R.
- R. Isolation Joints: preformed joint filler depth of slab, fill top 1/2 inch with elastomeric sealant per Section 07 92 00. Locations: at columns, footings, and as noted on drawings.
- S. Surface irregularities, ACI 347R Class A, gradual or abrupt irregularities of 1/8 inch for exposed to view concrete. Class B, 1/4 inch for plaster cement finish.

3.04 CURING AND PROTECTION

- A. In accordance with Section 03 39 00 Concrete Curing.

3.05 FIELD QUALITY CONTROL

- A. Provide free access to Work and cooperate with Architect, City and Testing Laboratory
- B. Measure floor and slab flatness and levelness according to ASTM E1155 (ASTM E 1155M) within 72 hours of finishing.
 - 1. Proposed mix design of each class of concrete shall conform to Section 1905A, California Building Code and shall be approved by the Architect prior to commencement of work.

3.06 PATCHING

- A. Architect will inspect concrete surfaces and determine imperfections, if any.
- B. Patch imperfections as approved and in accordance with ACI 301.
 - 1. Clean all exposed concrete surfaces and all adjoining work stained by leakage of concrete. Remove all fins, butts and projections by grinding. Patch voids, rock pockets, holes, cracks and similar imperfections by chipping loose concrete and exposing clean, sound aggregate.
 - 2. Fill cone form tie recesses with Portland cement mortar flush to finish surface.

3.07 DEFECTIVE CONCRETE

- A. Defective Concrete: Remove concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect.
- C. Do not patch, fill, touch-up, repair or replace exposed concrete except upon express approval of Architect for each individual area.
- D. Repairs of Concrete shall comply with the ACI and written directive from the Architect.

3.08 MOISTURE TEST FOR CONCRETE FLOORS

- A. Test and, if required, remediate all interior concrete slabs-on-grade scheduled to receive new moisture sensitive floor finishes.
- B. For topical vapor barrier refer to Section 09 60 01.

END OF SECTION

SECTION 03 35 43
POLISHED CONCRETE FINISHING

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: Polished concrete finishing
- B. Related Sections:
 - 1. Division 03 Section "Cast-Place Concrete."
 - 2. Division 07 Section "Joint Sealants."
 - 3. Division 22 Section(s) as applicable to floor drains and clean outs.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include installation requirements. Include plans, elevations, sections, component details, and attachments to other work.
- C. Qualification Data: For installer.
- D. Aggregate Class and Appearance Level: Submit CPC charts for review and approval of specified finish.
- E. Material Certificates: Signed by manufacturers certifying that the flooring complies with requirements specified herein.
- F. Maintenance Data: Submit manufacturer's written instructions for recommended maintenance practices.
 - 1. Supply 1-gallon of manufacturers cleaning solution.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum of 5-years documented experience producing specified products.
- B. Installer Qualifications: Manufacturer approved or accepted installer with a minimum of 5-years documented experience in work of this Section.

- C. Definitions: Aggregate exposure class and appearance levels as defined by Concrete Polishing Council (CPC).
- D. Source Limitations: Obtain materials from a single manufacturer.
- E. Slip Resistance: Installed floor systems shall have a minimum static coefficient of friction of not less than 0.50 for level surfaces as determined by testing per ANSI A137.1 Section 9.6 or in accordance with authorities having jurisdiction.
- F. VOC Compliance: Use products that have a VOC content of not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- G. Pre-Concrete Meeting: Review of concrete design.
 - 1. Schedule: Four (4) weeks prior to scheduled installation
 - 2. Attendance: Concrete finisher and Polishing installer
 - 3. Record meeting discussion, and approval for distribution to all parties.
 - 4. Review and discuss the following:
 - a. Floor Flatness (FF and FL) requirements, to achieve specified aggregate exposure class, ASTM E1155
 - 1) At Concrete Placement - F_F 60/ F_L 40 – super flat
 - 2) 30 Days after placement - F_F 45/ F_L 35 – very flat
 - 5. Concrete curing
 - 6. Specified aggregate exposure and appearance requirements
 - 7. Mix design and components:
 - a. Compressive strength: 4,000psi
 - b. Fly Ash: Limited to 5%
 - c. Slag: Not recommended.
 - d. Evaporation Retarders: Not recommended.
 - e. Addition of cellulose fiber as secondary reinforcement
 - f. Manufacturers finishing hardener
- H. Mock-Up: Installed system for review and written approval.
 - 1. Schedule: Four (4) weeks prior to scheduled installation.
 - 2. Size 100 square feet
 - 3. Location: As directed by Architect.
 - 4. Attendance: Architect, Installer, Construction Manager
 - 5. Review and discuss installed mock-up and the following for approval:
 - a. Interior environmental and lighting requirements.
 - b. Review aggregate exposure and appearance requirements.
 - c. ASTM D5767 Distinctness-of-Image requirements
 - d. ASTM D4039 Reflection Haze of High-Gloss Surfaces.
 - e. Protection of completed work.
 - 6. Remove rejected mock-ups and re-install materials as required by Architect.
 - 7. Allow up to three (3) mock up installations for review.
 - 8. Mockup- may remain as part of the Work when approved in writing by Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in in factory sealed containers, showing manufacturer's name, material and name, and lot number.

- B. Store materials indoors protected from weather, moisture, and damage, in accordance with manufacturer's written instructions.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Maintain ambient temperatures of not less than 45 deg F or more than 90 deg F, with relative humidity of less than 50 percent during installation.
- B. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during installation.
- C. Close spaces to traffic during application and for 72 hours (70 Deg. F) after final application. Protect adjacent construction from damage, debris and contamination.

PART 2 - PRODUCTS

2.1 POLISHED CONCRETE FINISHING

- A. Description: Concrete aggregate exposure, hardening, and polishing as a final floor finish.
- B. Basis-of-Design: Drawings and Specifications are based on the following:
 - 1. Multiquip, Inc.; Slab Armor
 - 2. Solomon Colors; Lythic
 - a. Subject to compliance with requirements, provide product indicated or a comparable product subject to Request for Substitution.

C. MATERIALS

- 1. Finishing Hardener: SlabArmor Starter.
 - a. Liquid applied, non-film forming, water based cure applied to new concrete during the placement and finishing process of freshly poured concrete as a multi-coat hardener.
 - b. pH Level: 6 – 9
 - c. Application Rate: 3 coats
 - d. VOC Content: less than 0.11 lbs./ gallon
 - e. Color: fugitive dye, dries clear.
- 2. Densifier: SlabArmor Closer
 - a. Liquid applied, multi-coat dust proof and hardening compound for abrasion, impact resistance, and water repellence.
 - b. pH Level: 11.5
 - c. VOC Content: less than 50 g/Liter
 - d. Application Rate: 1 coat
 - e. Color: Fugitive dye, dries clear.

3. Sealer: SlabArmor Seal and Shine
 - a. Liquid applied, stain and wear resistant finish with properties to improved sheen, hardness and chemical resistance.
 - b. pH Level: 11.0
 - c. Application Rate: 2 coats
 - d. Color: Colorless

2.2 ACCESSORIES

- A. Concrete Repair Materials: MatchPatch Pro www.matchpatchpro.com
 1. Joints: Two-component, 100-percent solids, polyurea based compound.
 2. Grout: Cement based pin hole grout filler.
 3. Crack and Spall: Color matching material composed of resin, Portland cement and latex binders.
- B. Temporary Floor Protection: Manufacturer recommended water and stain resistant material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SECONDARY REINFORCEMENT

- A. Add 1.5 lbs. per cubic yard following manufacturers instructions.

3.3 FINISHING HARDNER

- A. Apply three (3) coats of finishing hardner at a rate of 400 square feet per gallon during the concrete pouring and placement process.

3.4 POLISHING

- A. General: Apply each component of according to manufacturer's written installation instructions to produce a uniform monolithic floor finish.
- B. Grout and Crack Repairs: Apply as required to form continuous monolithic surface.
- C. Spalls and Surface Imperfections: Apply as required to match adjacent surfaces.
- D. Apply one (1) coat of undiluted densifier to the point of rejection, remove excess liquid, and allow to dry.

- E. Final Polished Concrete Floor Finish: Class B - Fine Aggregate; 85 to 95 percent fine aggregate, 5 to 15 percent blend of cement fines and coarse aggregate.
- F. Final Concrete Floor Gloss: Level 2 – Satin; image clarity value 10 to 39 percent, haze index less than 10.
- G. Test gloss to ASTM D5767 and haze to ASTM D 4039 prior to application of sealer at a minimum of one (1) test for each 1,000 square feet floor space. Surfaces not meeting required level are to be re-polished to meet results at no cost to Owner.
 - 1. Floor surfaces are to be smooth and free of visual abrasions, marks and scratches.

3.5 SEALING

- A. Apply two (2) coats of sealer following manufacturers instructions.
- B. Burnish to a uniform sheen matching approved mock-up.

3.4 FIELD QUALITY CONTROL

- A. Measure slip resistance using BOT-3000 slip-resistance tester; ensure compliance with specified requirement.
- B. Apply and maintain temporary floor protection to prevent damage and contamination until Substantial completion.

END OF SECTION

SECTION 03 39 00
CONCRETE CURING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Initial and final curing of horizontal and vertical concrete surfaces, excluding site work concrete.

1.02 REFERENCES

- A. ACI 318-14 - Building Code Requirements for Structural Concrete.
- B. ACI 301 - Structural Concrete for Buildings.
- C. ASTM C171 - Sheet Materials for Curing Concrete.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 318 Section 26.5.3 and ACI 308R. Proper curing of concrete shall be the Contractor's responsibility. Improperly cured concrete in the opinion of the Architect shall be removed and replaced at no extra cost to the Owner.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle sheet film materials to avoid puncturing or damage of any kind.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Curing Film: ASTM C171; 10 mil thick, clear polyethylene film, single sheet, manufactured from virgin resin with no scrap or additives, free of visible defects, uniform in appearance, conforming to the following:
Moisture Loss: 0.055 g per sq. cm.
Tensile Strength: 1700 psi longitudinal, 1200 psi transverse.
Elongation: 225 percent longitudinal, 350 percent transverse.
- B. Water: Potable and not detrimental to concrete.

PART 2 - EXECUTION

2.01 EXAMINATION

- A. Verify substrate conditions.

- B. Verify that substrate surfaces are ready to be cured.

2.02 EXECUTION - HORIZONTAL SURFACES

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.
- B. Maintain concrete with minimal moisture loss at above 50 degrees F temperature for period necessary for hydration of cement and hardening of concrete. Maintain concrete temperature below 95 degrees F. Dusting with dry cement to absorb excess water is prohibited.
- C. Cure floor surfaces only as specified herein and in accordance with Section 1905A.11 CBC. Membrane curing compound method not permitted for interior cast-in-place concrete slabs.
- D. Moisture Retaining Coverings: spread polyethylene film over floor slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for minimum of seven (7) days unless noted otherwise on drawings. Do not permit traffic over floor slabs during the seven (7) day curing period.
- E. Vertical Surfaces: fog spray water over surfaces and maintain wet for 10 days.
- F. Quality Control: Proper curing of concrete surfaces shall be the responsibility of the Contractor under this section.
- G. Flooding, sprinkling or ponding not permitted.

2.03 EXECUTION - VERTICAL SURFACES

- A. Spraying: Spray water over surfaces and maintain wet for 10 days.

2.04 PROTECTION OF FINISHED WORK

- A. Protect finished Work from damage caused by the work of other sections.
- B. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 03 39 10
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. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated, include manufacturer's specification data, installation instructions, and statement of VOC content.
- C. Reports: Laboratory test reports.
- D. Digital Photographs: Digital photography of completed installation, including surface preparation of concrete slabs.
- E. Qualification Data: For qualified Applicator.
- F. Field quality-control reports by manufacturer's technical representative.
- G. 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.
 - 2. Division 07 Section "Underslab Vapor Barrier:" Confirm installation with manufacturer.
 - 3. Division 09 Section "Flooring Moisture and Alkalinity Testing:" Review and coordinate preparation of concrete slabs on grade with testing requirements and preparation procedures.
 - 4. Division 09 Section "Finishes" Review and coordinate preparation of concrete slabs on grade with adhered flooring finishes.

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 \$6,000,000 per occurrence listing Architect and Owner as additional insured. Sub-contractor general liability certificates are not acceptable.

PART 2 - PRODUCTS

2.1 TOPICAL CONCRETE VAPOR CONTROL BARRIERS FOR NEW CONCRETE

- A. Description: Liquid applied, epoxy based product for application to newly poured 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 10 (Single component product for application on new concrete, 2 coats).
 - 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 RH in accordance with ASTM F2170.
 - b. Water Vapor Transmission Rate (WRT), ASTM E96:
 - 1) Grains/sf/hour: 1.0.
 - 2) Pounds/1,000 sf/24 hours: 3.3.
 - 3) Grams/hour per square meter: 0.7.
 - c. Water Vapor Permeance (WVP), ASTM E96:
 - 1) Perm (inch-pound): 2.4.
 - 2) Grams/Pa s m² x 10 (-8): 13.6.
 - 3) Nanograms/Pa s m²: 136.3
 - d. Vapor Emission Testing, ASTM F 1869: Not more than 3 lbs.

- e. Alkali Resistance: 100% resistant to 30 day exposure to 14 pH in accordance with ASTM D1308; 35 percent potassium hydroxide resistant in accordance with ASTM D1308.
 - f. Alkalinity Control: Suppress 12.5 to 14 pH without damage.
 - g. Concrete Adhesion: 600 psi or concrete cohesive failure in accordance with ASTM FD4541.
3. Physical Properties:
- a. Product Type: Penetrating water-based polymer with crack resistance.
 - b. Product Color: Clear or white.
 - c. Solids Content: 25 to 50 percent by volume.
 - d. Thickness: 6 - 10 mills, DFT.
 - e. Material Mixture: Synthetic 10: Single component.
 - f. Number of Coats: Synthetic 10: Two-coats.
 - g. Spread Rate: Synthetic 10: Two coats, 250 square feet per gallon per coat.
 - h. Flooring Ready: 12 to 24 hours.
 - i. Foot Traffic: 8 to 12 hours.
 - j. Product Odor: Slight odor.
 - k. Environmental: Non-corrosive, water based, water clean up product.
 - l. Product is non-organic and will not support the growth of mold, mildew, or microorganisms.
 - m. Product is non-corrosive, non-combustible, non-flammable, and non-hazardous to installers.
 - n. Product is not classified as a marine pollutant.
 - o. Product is water soluble.
 - p. Volatile Organic Compounds (VOC) Content: 50 to 65 g/liter per EPA Method 24.
4. Location: Provide where concrete is exposed under flooring finishes, including resilient luxury tile flooring and tile carpeting.

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 TO FRESH CONCRETE

- 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. Topical concrete vapor control barrier shall be applied in replacement of standard curing, sealing and hardening compounds.
- C. Mix and apply product in accordance with manufacturer's written installation instructions.
- D. 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.
- E. Protect from walking traffic for 12 hours and heavy traffic for 36 hours.

3.4 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 an 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.

3.5 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 04 22 00

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes furnishing and installing the following for buildings and fences:

1. Concrete masonry precision units as indicated in drawings, with special shapes and score patterns as indicated or required.
2. Concrete masonry fence unit as indicated in drawings including precision with special size, shapes and score patterns as indicated or required.
3. All reinforcement, grout, mortar and accessories.
4. Clear sealer at exposed concrete masonry not indicated for opaque paint or other finishes.

B. Related Sections:

1. Division 3 Section, "Cast-in-Place Concrete"
2. Division 5 Section, "Metal Fabrications"

1.02 REFERENCES

A. ASTM International (ASTM)

1. ASTM C33 – Standard Specification for Concrete Aggregates.
2. ASTM C90-11b — Standard Specification for Load-Bearing Concrete Masonry Units.
3. ASTM C129 – Standard Specification for Non-Load-Bearing Concrete Masonry Units.
4. ASTM C140-12 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
5. ASTM C270-12 – Standard Specification for Mortar for Unit Masonry.
6. ASTM C476-10 – Standard Specification for Grout for Masonry.
7. ASTM C1019 – Standard Test Method for Sampling and Testing Grout.
8. ASTM C578, Type X – Specification for Rigid Cellular Polystyrene Thermal Insulation.
9. ASTM A615 – Gr. 60 – Standard Specification for reinforcing steel.

B. Building Code Requirements and Specification for Masonry Structures:

1. TMS 402/602-16.

C. 2019 California Building Code (CBC)

D. National Concrete Masonry Association (NCMA):

1. NCMA TEK Bulletin #8-2A – Removal of Stains from Concrete Masonry.
2. NCMA TEK Bulletin #8-3A – Control and Removal of Efflorescence.
3. NCMA TEK Bulletin #9-4A – Grouts for Concrete Masonry.
4. NCMA TEK Bulletin #19-4 – Flashing for Concrete Masonry.
5. NCMA TEK Bulletin #3-1B – All-Weather Concrete Masonry Construction.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each different masonry unit, accessory, and other manufactured product indicated.
- C. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.
- D. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.
1. Each different cement product required for mortar and grout including name of manufacturer, brand, type, and weight slips at time of delivery.
 2. Each material and grade indicated for reinforcing bars.
 3. Each type and size of joint reinforcement.
- E. Color Selection: For initial selection submit:
1. Unit masonry samples showing full extent of colors and textures available for each type of exposed unit masonry required.
 2. Colored mortar samples showing full extent of Manufacturer's colors available.
- F. Samples: For verification purposes submit:
1. Samples for each style & color specified of exposed masonry unit specified, including full range of color and texture to be expected in completed work.
 2. Colored masonry mortar samples for each color required. Show full range of color which can be expected in finished work; label samples to indicate type and amount of colorant used.
- G. Material test reports from a qualified independent testing laboratory employed and paid by Contractor indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:
1. Mortar complying with property requirements of ASTM C 270.
 2. Grout mixes. Include description of type and proportions of grout ingredients.

3. Masonry units.

- H. Results from tests and inspections performed by Owner's representatives will be reported promptly and in writing to Architect and Contractor.
- I. Submit Warranties in accordance with Section 01 78 36.

1.04 QUALITY ASSURANCE

- A. All Unit Masonry shall conform to the 2019 edition of the California Building Code (CBC).
- B. Unit Masonry Standard: Comply with TMS 402-13 and TMS 602-13, ACI 530-11/ASCE 5-13, ACI 530.1-13/ASCE 6-13 "Specifications for Masonry Structures." Also comply with recommendations in referenced ASTM Standards and NCMA Bulletins where more stringent than ACI and CBC requirements.
- C. Inspecting Laboratory Qualifications: To qualify for employment in performing tests and inspection specified in this Section, an independent testing laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM C 1093, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of the Work.
- D. Material Testing: Owner will employ and pay a qualified independent testing laboratory to perform the following material testing indicated as well as other inspecting and testing services required by referenced unit masonry standard or indicated herein for source and field quality control.

1. The following tests shall be performed prior to construction:

- a. Concrete Masonry Unit Tests: For each different concrete masonry unit indicated, test units for strength, absorption, and moisture content per ASTM C 140.
- b. Grout compressive strength will be tested per ASTM C 1019.
- c. Mortar compressive strength will be tested per ASTM C 270.
- d. Drying shrinkage testing per ASTM C426-10. (Drying Shrinkage tests are not required to be performed to provide results prior to start of construction and will not be a cause of delay in the project construction schedule. Drying shrinkage test results may be used to assist in the determination of causes of excessive cracking and/or unacceptable masonry performance. Drying Shrinkage tests may only be waived by the project Owner.)

2. Refer to Section 3.08 – FIELD QUALITY CONTROL for testing required during the construction progress:

- E. Contractor is responsible for the scheduling of material testings. Material testings schedule shall not interrupt the project construction schedule, unless tests provide unsatisfactory results requiring adjustments in material mix designs and fabrications requiring further testings.

- F. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of

uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

- G. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.
- C. Store cementitious materials off the ground, under cover, and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.06 PROJECT CONDITIONS

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
- C. Cold-Weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:
 - 1. Do not lay masonry units that are wet or frozen.

2. Remove masonry damaged by freezing conditions.
 3. Comply with TMS 602, Section 1.8 C.
- D. Hot-Weather Construction: Comply with referenced unit masonry standard for hot-weather construction and the following:
1. Comply with TMS 602, Section 1.8 D.

PART 2 – PRODUCTS

2.01 MATERIALS, GENERAL

- A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.
- B. Acceptable manufacturer: Basalite, 1201 Golden State Blvd., Selma, CA 93662, Tel: 559-896-1649, or approved equal.
- C. Substitutions will be considered only in accordance with Section 01 25 00, submitted a minimum of 14 days prior to bid submittal date and approved prior to bid.

2.02 CONCRETE MASONRY UNITS

- A. General: Comply with requirements indicated below applicable to each form of concrete masonry unit required.
 1. Provide special shapes and colors where indicated and as follows:
 - a. For corners, control joints, bonding, and other special conditions.
 - b. Square-edged units for outside corners.
 - c. Textures, patterns and coursing shall be as indicated in drawings.
 - d. For interior, exposed surfaces, CMU units shall be 'ground-face' finished and sealed. Color based on Basalite 113 – Ground Face (Dixon, CA) or approved equal.
 2. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.
 - a. Concrete Masonry Units: Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.
 - b. Standard Precision Units: Width x height x length: 8"x8"x16", 8"x8"x8", 10"x8"x16", 10"x8"x8", 12"x8"x16", 12"x8"x8" and other sizes indicated or required including pilaster units, sill blocks and caps as indicated in drawings.

- c. Standard Ground Face Units: Width x height x length: 12"x8"x16", 12"x8"x8" and other sizes indicated or requires including pilaster units, sill blocks and caps as indicated in drawings.

B. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, and as follows:

1. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 2000 psi to achieve a masonry design strength of 2000 psi, minimum.
2. Maximum 0.065% linear shrinkage when tested in accordance with CMA standards.
3. Weight Classification: Light weight or Normal weight. All units of any type or color shall be of the same weight category.
4. Comply with CBC Standards and ACI 530.

2.03 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type II low alkali, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce required mortar color. Masonry cement will not be permitted. Maintain cement type throughout project.
- B. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this article, combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Colored Pigmented Mortar: Use pure mineral oxide mortar color; proportion by weight.
- E. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4-inch use aggregate graded with 100 percent passing the No. 16 sieve.
- F. Grout: Minimum 2,000 psi compressive strength. Aggregate = ASTM C 404.
- G. Water: Clean and potable, free from impurities detrimental to mortar and grout.
- H. Admixtures
 1. Only with Architect's approval and not adversely affecting bond or compressive strength.
 2. Grout Aid: All grout shall contain Sika "Grout Aid" (GA) as manufactured by Sika Chemical Corp. Mix GA as recommended by manufacturer.
- I. Comply with CBC, Section 2103.

2.04 REINFORCING STEEL

- A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article, with size and spacing as indicated in drawings.
- B. Steel Reinforcing Bars: Material and grade as follows:
 - 1. Billet steel complying with ASTM A 615 – Grade 60 deformed bars.
- C. Wire Ties: No. 16 annealed wire for tying reinforcing steel.

2.05 MISCELLANEOUS MASONRY ACCESSORIES

- A. Control Joints:
 - 1. At Walls and Fences: Use joint type as detailed. Caulking shall match mortar joint color and sheen.
 - 2. At soil retained walls: Where soil occurs use preformed rubber in profiles required or shown, same as Dur-O-Wal Inc.'s "Rapid Control Joint," or approved substitute.
- B. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- C. Refer to the structural drawings for joint locations.

2.06 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned:
 - 1. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface-acting acids, chelating, and wetting agents.
 - 2. Available Products: Subject to compliance with requirements, a product that may be used to clean unit masonry surfaces includes, but is not limited to, the following:
 - a. "Sure Klean No. 600 Detergent," ProSoCo, Inc.

2.07 MORTAR AND GROUT MIXES

- A. General: Do not add admixtures including coloring 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.

- B. Mortar for Unit Masonry: Comply with ASTM C 270, Type S, Proportion Specification, for types of mortar indicated below:
 - 1. Limit cementitious materials in mortar to Portland cement-lime.
 - 2. Refer to structural drawings for mortar mix proportions. Comply with CBC, Section 2103.9 and TMS 602, Table SC-1.
- C. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required as selected and approved by the architect from the colors available from the Manufacturer.
- D. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.
 - 1. Grout shall be a coarse grout designed to attain a compressive strength of 2000 psi at 28 days.
 - 2. Grout shall be composed of 1 part Portland Cement, not more than 1/10 part hydrated lime fine aggregate at 2 ¾ to 3 times the sum of the volumes of the cementitious materials, and pea gravel at 1 to 2 times the sum of the volumes of the cementitious materials, grout aid and sufficient water to attain a slump between 8 and 10 inches without segregation.
 - 3. Materials for grout shall be measured in suitable calibrated devices. After the addition of water, all materials shall be mixed for at least 3 minutes in a drum type batch mixer. Mixing equipment and procedures shall produce grout with the uniformity required for concrete by ASTM C94.

2.08 SEALER

- A. Sealer for exposed masonry surfaces not otherwise indicated to be painted, unfinished or receive other finish shall be a clear non-yellowing silicone water repellent. Apply two coats of sealer to CMU wall surfaces. Prepare all surfaces as recommended by the manufacturer. Materials shall be installed per all manufacturer recommendations and requirements.

2.09 SOURCE QUALITY CONTROL

- A. Concrete Masonry Unit Tests: For each type, class, and grade of concrete masonry unit indicated, units will be tested by qualified independent testing laboratory for strength, absorption, and moisture content per ASTM C 140, and linear drying shrinkage per ASTM C146.
- B. Grout Unit Tests: Grout shall be tested for compressive strength per ASTM C1019.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for

installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.
- B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation and verify compliance with number and locations of conduits within unit cells.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in Project.
- B. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.
- C. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.
- D. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.
- E. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.
- F. CONDUITS AND PIPES IN MASONRY WALLS:

1. Conduits, up to $\frac{3}{4}$ " diameter, shall be allowed in cells for vertical runs only, in accordance with the following parameters. No horizontal runs are allowed except that vertical offsets up to 24" in length will be allowed to avoid interference and congestion with reinforcing steel and other embedded items.

Water, gas and other pipes may penetrate through a wall in a sleeve but shall not be embedded in walls.

2. Reinforced cells: Limit conduit to 1 – $\frac{3}{4}$ " dia. conduit per cell, provided the following conditions are maintained:
 - a) Reinf. Steel shall be properly placed and shall not be relocated to accommodate conduits.

- b) Grout cover between conduit and reinf. Steel shall be 2.5 x bar dia., 1/2" min. (1 1/2" @ #5, 1 7/8" @ #6).
 - b) Maintain a minimum clear area within the cell of 3"x3" for consolidation by vibration.
- 3. Unreinforced cells: Limit conduit to 2 – 3/4" dia. or 1-1" dia. conduit per cell, provided the following conditions are maintained:
 - a) Conduit shall not be placed closer than 3 dia., center to center, to adjacent conduit.
 - b) Maintain a minimum clear area within the cell of 3"x3" for consolidation by vibration.
- 4. No pipes or conduits are allowed in walls less than 8" nominal thickness.
- 5. No pipes or conduits are allowed in the thermal insulation portion of the Korfil Hi-R wall units.
- H. Retaining walls:
 - 1. Masonry retaining walls designed to be tied to floor or roof at top of wall shall be braced prior to the placement of backfill.
 - 2. Cantilever retaining walls shall not be braced.
 - 3. Backfill placement shall be performed in proper lifts under soil engineer supervision to avoid developing significant lateral earth pressures.

3.03 CONSTRUCTION TOLERANCES

- A. Comply with construction tolerances of referenced unit masonry standard ACI 530.1-05, Part 3, 3.3G.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.
- B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. Stack Bond, unless otherwise indicated in drawings.
 2. Maximum spacing of reinforcing steel is 16".
- D. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry. If work is stopped for one hour or more, stop grout at 1/2" min. and 2" max. below top of units.
- E. Built-In Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
 - a. At exterior frames insert extruded polystyrene board insulation around perimeter of frame in thickness indicated but not less than 3/4 inch to act as a thermal break between frame and masonry.

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
1. Typical Wall Units – All head and bed joints shall be with full mortar coverage on horizontal and vertical face shells for a distance in from the face of the unit not less than the thickness of the shell.
 2. Columns, Pilasters and Wall Piers not exceeding 32" in length – All head and bed joints shall be with full mortar coverage. Face-to-face units shall have full mortar coverage over the contact surfaces. Bed webs in mortar in starting course on footings and in all courses of columns, pilasters and piers, and where adjacent to cells or cavities to be filled with grout.
 3. Starting Course – At starting course on footings and slabs, spread out full mortar bed including areas under cells. Initial joint shall not be less than 1/4" nor more than 3/4" in thickness. Comply with ACI 530.1, Section 3.3 B.1.
- B. Set stone units in full bed of mortar with all vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone joint surface thoroughly before setting; for stone surfaces that are soiled, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
- C. Cut joints flush for masonry walls to be concealed or to be covered by other materials, unless otherwise indicated.

3.06 MOVEMENT (CONTROL AND EXPANSION) JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated or based

on industry standards. Build in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Install preformed control joint gaskets designed to fit standard sash block.

3.07 INSTALLATION OF REINFORCED UNIT MASONRY

A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard.

B. Temporary Formwork: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make 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.

C. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Prepare masonry work for grouting in conformance with TMS 602, 3.2.
2. Place grout in conformance with TMS 602, 3.5.
3. Do not exceed grout '**pours**' heights per TMS 602, table 6.
4. Where grout '**pours**' exceed 5'-4" cleanouts are required.
4. Grout '**lifts**' shall not exceed 5'-4". Comply with TMS 602, 3.5D.1.c.

D. Cleanouts: Clean-out openings shall be provided in conformance with TMS 602, 3.2 F. Provide cleanouts in the bottom course of masonry for each grout 'pour' when the grout 'pour' height exceeds 5 ft. 4 in. by one of the following methods.

1. Construct the course at the bottom of the pour with inverted, open-end bond-beam units and provide cleanouts in each reinforced cell by removing the face shell.
2. Where Cleanouts are located below concrete slabs or in locations where the wall surface is not visible, Cleanout openings may be tightly form plugged. Cleanouts shall not be located in areas where the wall surface is exposed in the final condition.
3. Cleanouts shall be scaled before grouting, after inspection.

C. 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.

3.08 FIELD QUALITY CONTROL

- A. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
 - 2. Mortar composition and properties will be evaluated per ASTM C 780.
 - 3. Grout compressive strength will be sampled and tested per ASTM C 1019.
- B. Verification of Masonry Strength: Verify masonry strength, f_m, by one of the following methods as outlined in CBC, Section 2105A.2, .3 and .4:
 - 1. Unit Strength Method: Mortar and grout testing per CBC, Section 2105A.3.
 - 2. Masonry Core Testing: CBC, Section 2105A.4.
- D. All structural masonry work shall be continuously inspected during laying, reinforcing placement and grouting by an inspector specially approved for that purpose by the architect and Owner.
 - 1. Comply with TMS 602, Table 4 – Level 2 Quality Assurance for minimum testing and inspection required.

3.09 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.
- C. 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 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 - 4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - 5. Clean brick by means of bucket and brush hand-cleaning method described in BIA "Technical Note No. 20 Revised" using the following masonry cleaner:
 - a. Proprietary acidic cleaner; apply in compliance with directions of acidic cleaner manufacturer.

6. Clean concrete masonry by means of cleaning method indicated in NCMA TEK 45 applicable to type of stain present on exposed surfaces.
-
- D. Finish Application: When concrete masonry is clean and dry, apply 2 coats of clear sealer in accordance with manufacturer's instruction and recommendations. Other finishes where indicated shall be applied in accordance with and by the applicable specification and trade.
 - E. Protection: Provide final protection and maintain conditions in a manner acceptable to Installer that ensures unit masonry is without damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes fabrication and erection of structural steel work, as shown on drawings including schedules, notes, and details showing size and location of members, typical connections, and types of steel required.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
 - 2. Division 5 Section "Metal Fabrications" for loose steel bearing plates and miscellaneous steel framing.
 - 3. Refer to Division 3 for anchor bolt installation in concrete.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
 - 2. Structural steel primer paint.
 - 3. Shrinkage-resistant grout.
- C. Shop Drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
 - 1. Fabricator and detailer shall be responsible for coordination of all contract documents for required steel work. Comply with AISC – Code of Standard Practice for Steel buildings and Bridges, Section 4.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

3. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
 4. Where drawings are in conflict, detailing shall not be completed for affected items until the detailer has requested clarification/revision from the Architect and has received written directive for such change as may be required. Request for clarification/revision shall be by RFI or by clouded comment on the initial shop drawing submittal. Fabricator shall be responsible for changes to the shop drawings required where shop drawings have progressed prior to resolution of discrepancies.
 5. Detailing shall allow for minor coordination changes and revisions as a part of the contract services.
- D. Inspection reports conducted on shop and field High-Strength 'Slip Critical' bolted and welded connections: Include data on type(s) of tests conducted and test results.

1.04 QUALITY ASSURANCE

- A. Shop Drawings: Fabricator shop drawings shall be submitted in compliance with Division 01, Section 01 33 00.
1. Comply with AISC Code of Standard Practice for Steel Buildings and Bridges, Section 4.
 2. Use of CAD files and/or copies of design drawings: Comply with AISC Code of Standard Practice, Section 4.3 with the following exception:
 - a. Replace section 4.3 (d) with the following: "The Contractor shall compensate the Engineer, not to exceed \$50.00 per drawing, for preparation of CAD files including the removal of information that is not required for the fabrication or erection of the structural steel from the CAD files for the preparation of CAD files to be used as part of the shop or erection drawings.
- B. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
1. American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges."
 - a. In conformance with paragraph 3.2, the structural drawings identify the steel required for support of architectural, mechanical and electrical equipment. Contractor shall refer to the architectural, mechanical and electrical drawings for detail configurations and other construction information.
 - b. Paragraph 4.3 (a) of the above code is hereby modified per Section 1.04 A.2.
 2. AISC "Specifications for Structural Steel Buildings," including "Commentary."
 3. "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connections.

4. American Welding Society (AWS) D1.1 and D1.8 "Structural Welding Code - Steel."
 5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
 6. California Building Code (CBC), 2019 edition, Chapter 22.
- C. Installer Qualifications: Steel work installers shall meet one or more of the following:
1. A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector with more than 5 years experience with similar work.
 2. A steel work installer with a minimum of 5 years experience who has successfully completed three (3) projects of similar scope and size to that specified for this project.
- D. Fabricator Qualifications: Steel Fabricator shall meet one or more of the following. 'Fabricator' shall mean the owner/operator of the fabrication business having active participation/supervision in the project fabrication:
1. A qualified 'Fabricator' who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant.
 2. A 'Fabricator' who has a minimum of 5 years experience who has successfully completed at least three (3) projects of similar scope and size to that specified for this project in the past 5 years.
- E. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS "Qualification" requirements.
1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous 12 months for the types of welding to be performed.
 2. If recertification of welders is required, retesting will be the Contractor's responsibility.
- 1.05 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials to Project site in such quantities and at such times to ensure uninterrupted progress of Work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay Work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
1. Clean and relubricate bolts and nuts that become dry or rusty before use.
 2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Metal Surfaces, General: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including the following. Refer to 2.02, A.4.:
 - 1. Pitting.
 - 2. Rust and scale.
 - 3. Seam marks.
 - 4. Roller marks.
 - 5. Rolled trade names.
 - 6. Roughness.
- B. Remove blemishes by grinding or by welding and grinding prior to cleaning, treating, and applying surface finishes.
- C. Structural Steel W, S and M shapes: ASTM A992.
- D. Structural Steel C and MC shapes, Angles, Plates and Bars: ASTM A36.
- E. Braced-Frame and Moment-Frame Gusset Plates, Base Plates and Cap Plates: ASTM A992.
- F. Square Cold-Formed Structural Steel Tubing (HSS): ASTM A500, Grade B.
- G. Round Structural Steel Tubing: ASTM A53, Grade B.
- H. Unheaded Anchor Bolts and Nuts: ASTM A 307, Grade C or ASTM F 1554, Grade 36; unheaded, unless otherwise indicated. Use headed bolts where embedded in the sides of masonry units or embedded into concrete for other than sill bolting.
- I. Headed Anchor Bolts and Nuts: ASTM A 307, Grade A or ASTM F 1554, Grade 36 headed, unless otherwise indicated.
- J. Unfinished Threaded Fasteners and Nuts: ASTM A307 or ASTM A; regular low carbon-steel bolts; and carbon-steel nuts.
 - 1. Provide either hex or square heads and nuts.
 - 2. Use only hex units for exposed connections.
- K. High-Strength Threaded Fasteners: Heavy hex structural bolts, heavy hex nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium carbon-steel bolts, nuts and washers, complying with ASTM A325.
 - a. Where indicated as "SC" type connections – Provide "Slip-Critical" connections with faying surfaces per AISC.

- b. Where indicated as galvanized, provide units that are mechanically deposited zinc-coating, ASTM B 695, Class 50 or Hot-dip zinc-coating, ASTM A153.
- L. Welding Electrodes: Comply with AWS Code; ASTM 233, E-70 Series.
- M. Structural Steel Primer Paint: Series L69, Hi Build Epoxoline II, Red color Low VOC epoxy, air dried, by Thnemec or equal as approved in accordance with Div 01 for Substitutions. Manufacturer's standard primer for unpainted steel permanently enclosed in walls and above ceilings.
- N. Cement Grout: Portland cement (ASTM C 150, Type II or Type III) and clean, uniformly graded natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.
- O. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621. Minimum 5,000 psi in 7 days.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
 - a. SonogROUT; Sonneborn/Context.
 - b. Euco N.S.; Euclid Chemical Co.
 - c. Sealtight 588 Grout; W. R. Meadows.

2.02 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications on final Shop Drawings.
 - 1. Properly mark and match-mark materials for field assembly.
 - 2. Fabricate for delivery a sequence that will expedite erection and minimize field handling for materials.
 - 3. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
 - 4. All members and components exposed to view in the final condition shall be fabricated in compliance with AISC – AESS 1 (Architecturally Exposed Structural Steel). Comply with AISC Section 10 for the fabrication of AESS steel.
- B. Connections: Weld or bolt shop connections, as indicated.

Bolt field connections, except where welded connections or other connections are indicated.

 - 1. Provide high-strength 'Slip Critical' threaded fasteners where indicated as "SC" type.

2. Provide unfinished threaded fasteners for other connections primary and of secondary framing members to primary members (including girders, beams, purlins, girts, bracings and other framing members used) and for temporary bracing to facilitate erection.
- C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A 490 Bolts" for "slip-critical" type connections (SC). High strength bolts specified as A325 "bearing" type do not require faying surface preparation and shall be "torque indicator" type bolts.
- D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Comply with AISC 10.2.5 for AESS component welding.
- E. Assemble and weld built-up sections by methods that will produce true alignment of axes without warp.
- F. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on final Shop Drawings.
1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
 2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.
 3. Provide unfinished threaded fasteners for other primary connections and for secondary framing members to primary members and for temporary bracings to facilitate erection.
- G. Expansion Joints: Provide expansion joints in steel shelf angles when part of structural steel frame; locate at vertical expansion joints as indicated on drawings.
- H. Camber: Where cambers in steel members are indicated, cambering shall be in accordance with Section 6 of the AISC Code of Standard Practice for Buildings and Bridges. Cambers shall be by "cold cambering" unless fabricator's shop facilities can produce specified results by "heat cambering" without detrimental effects on the steel materials. Fabricator shall have successful experience history of "heat cambering" and shall obtain architect's approval before proceeding. Where aesthetic cambering in steel is required as indicated on the drawings cambering shall be by roller bending or other approved means so as to produce a smooth radius curve the full length of the member or between any two points indicated. Where camber is specified for cantilever beams the back-span camber shall be a radius curve between the two supports and the cantilever camber shall be a radius curve from the cantilever support to the end of the cantilever, unless otherwise specified. Indicate cambering on the shop drawings.

2.03 SHOP PAINTING / GALVANIZING

- A. General: All steel members and components not exposed to view shall be Shop Primed per 2.01, M. Paint embedded steel to the initial 2 inches of embedded areas.
 - 1. Do not paint surfaces to be welded.
 - 2. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
 - 1. SP-1 "Solvent Cleaning."
 - 2. SP-2 "Hand-Tool Cleaning."
 - 3. SP-3 "Power-Tool Cleaning."
- C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces.
- D. Exposed Steel: All steel exposed to view in final condition shall be galvanized. Galvanize steel items to zinc coating thickness in accordance with ASTM A123, minimum Coating Grade 80 (1.9 oz/sq. ft.). Surfaces shall be free of icicles, spangles and puddling. Provide venting holes at all enclosed sections, "V" notch, and drilled holes are acceptable. Locate to prevent rainwater from entering enclosed sections at exterior galvanized items.
- E. For sheet steel items, galvanize per ASTM A653 G60 Coating Designation.

2.04 SOURCE QUALITY CONTROL

- A. General: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency.
 - 1. Inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
 - 2. Promptly remove and replace materials or fabricated components that do not comply.
- B. Design of Members and Connections: Steel supplier, fabricator or erector shall not design any portion of the steel structural components used. Details shown on the drawings are typical; similar details apply to similar conditions, unless otherwise indicated. Where information is not provided to complete the construction, contractor shall inform architect. Work shall not continue on affected components until written directive has been submitted.
 - 1. Verify dimensions at site whenever possible without causing delay in the work.

2. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

PART 3 - EXECUTION

3.01 ERECTION

- A. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads.
 1. Remove temporary members and connections when permanent members are in place and final connections are made.
 2. Provide temporary guide lines to achieve proper alignment of structures as erection proceeds.
- B. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work; see Section 01500.
- C. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
 1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
 3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 4. For proprietary grout materials, comply with manufacturer's instructions.
- D. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Comply with AISC Section 10 for the handling and erection of AESS steel.
- E. Level and plumb individual members of structure within specified AISC tolerances.
- F. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
- G. Splice members only where indicated and accepted on Shop Drawings.

- H. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.
 - 1. Comply with AISC specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 - 2. Do not enlarge unfair holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- I. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
- J. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

3.02 QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to inspect high-strength bolted connections and welded connections and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- C. Testing agency may inspect structural steel at plant before shipment.
- D. Correct deficiencies in or remove and replace structural steel that does not comply with specified requirements.
- E. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

END OF SECTION

SECTION 05 31 00

STEEL DECK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This Section includes steel deck units for floor and roof applications.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data including manufacturer's specifications and installation instructions for each type of decking and accessories.
 - 2. Shop drawings showing layout and types of deck units, anchorage details, and conditions requiring closure strips, supplementary framing, sump pans, cant strips, cut openings, special jointing, and other accessories.
 - 3. Material identification by mill reports covering chemical and physical properties.
 - 4. Welder's certificates.
 - 5. Research / Evaluation Reports.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated:
 - 1. American Iron and Steel Institute (AISI), "Specification for the Design of Cold-Formed Steel Structural Members."
 - 2. American Welding Society (AWS), D1.3 "Structural Welding Code - Sheet Steel."
 - 3. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks and Roof Decks."
 - 4. 2019 CBC, Chapter 22, Section 2210.
- B. Installer Qualifications: An experienced installer who has completed steel deck installation projects similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-

service performance.

- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Welding: Qualify procedures and personnel according to AWS D 1.1, "Structural Welding Code—Steel," and AWS D 1.3, "Structural Welding Code –Sheet Steel."
- E. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- F. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
- C. Handle steel deck so as to avoid damage.
 - 1. Unexposed deck: Denting, crippling or buckling of unexposed deck may be cause for rejection depending on the Engineer's and Inspector's evaluations.
 - 2. Exposed deck: Any visible damage or surface marring will be cause for rejection of all exposed deck materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: As specified herein with properties as specified on the structural drawings, or approved substitution. Manufacturer's products shall have I.C.C. approval and shall conform to the A.I.S.I.

1. Verco Manufacturing Company.
2. ASC Steel Deck.
3. Epic Metals Corporation.

2.2 MATERIALS

- A. Steel for Painted Metal Deck Units: ASTM A 611, grade as required to comply with SDI specifications.
- B. Steel for Galvanized Metal Deck Units: ASTM A 446, grade as required to comply with SDI specifications.
- C. Miscellaneous Steel Shapes: ASTM A 36.
- D. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.
- E. Galvanizing: ASTM A 525, G60.
- F. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.
- G. Refer to drawings for deck section profiles, properties and connection types at locations indicated.

2.3 FABRICATION

- A. Roof Deck Units: Provide deck configurations that comply with SDI "Specifications and Commentary for Steel Roof Deck." See structural drawings for section properties and dimensional requirements.
- B. Floor Deck Units: Provide deck configurations that comply with SDI "Specifications and Commentary for Steel Floor Deck." See structural drawings for section properties and dimensional requirements.
- C. Fabricate panels in compliance with the AISI Specification and minimum section properties indicated on the structural drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install deck units and accessories in accordance with manufacturer's recommendations, shop drawings, and as specified herein.

- B. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
- C. Place deck units flat and square, secured to adjacent framing without warp or deflection.
- D. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
- E. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- F. Fastening Deck Units:
 - 1. Weld fastened as indicated in the drawings. All deck welding is subject to "Special inspection".
- G. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.
- H. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.
- I. Hanger Slots or Clips: Provide UL-approved punched hanger slots between cells or flutes of lower element where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.
- J. Touch-Up Painting: After decking installation, wire brush, clean, and paint scarred areas, welds, and rust spots on top and bottom surfaces of decking units and supporting steel members.
 - 1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
 - 2. Touch-up painted surfaces with same type of shop paint used on adjacent surfaces.

3.2 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing as required.
- B. Field welds will be subject to inspection.
- C. Shear connector studs welds will be inspected and tested according to AWS D 1.1 for stud welding and as follows:
 - 1. Shear connector stud welds will be visually inspected.

2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
 3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D 1.1.
- D. Testing agency will report test results promptly and in writing to Contractor, Architect and DSA.
- E. Remove and replace work that does not comply with specified requirements.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.3 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
1. Apply repair paint, of color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 9 Section "<Painting>."
- C. Repair Painting: Wire brushing, cleaning and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 9 Section "<Painting>."
- D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fabrications and installations of types of cold-formed metal framing units include the following:
 - 1. C-shaped load-bearing and non-load-bearing, punched and un-punched channel studs and joists with stiffened flanges.
 - 2. C-shaped load-bearing and non-load-bearing steel stud track.
 - 3. C-shaped un-punched blockings, headers and miscellaneous components.
 - 4. Lt.-gauge straps, z-shaped and "hat" shaped furring.

1.02 REFERENCES

- A. CBC 2019 - California Building Code
- B. SSMA - Steel Stud Manufacturers Association

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data and installation instructions for each item of cold-formed metal framing and accessories.
 - 2. Shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data.
 - a. Include placing drawings for framing members showing size and gage designations, number, type, location, and spacing. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

1.03 QUALITY ASSURANCE

- A. Component Design: Calculate structural properties of studs and joists in accordance with American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members."
- B. All component section properties shall comply with the Steel Stud Manufacturer's Association (SSMA). Refer to structural drawings for minimum section properties for each component used.
- C. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations,

provide units that have been approved by governing authorities that have jurisdiction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, Manufacturer shall be a member of the Steel Stud Manufacturer's Association (SSMA).

2.02 METAL FRAMING

- A. System Components: Manufacturer's components shall comply with the section properties of the SSMA. Manufacturers' standard load-bearing steel studs and joists of type, size, shape, and gauge as indicated. With each type of metal framing required, provide manufacturer's standard, steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system. All framing components shall be of the gauge indicated on the structural drawings, minimum 20 gauge steel, except as otherwise indicated.
- B. Materials and Finishes:
 - 1. Bearing and non-bearing studs may be punched sections, unless specified otherwise. Comply with structural drawings for limitations on punch-out locations from ends of studs.
 - 2. All joists and rafters shall be un-punched sections. Holes required for access of conduit and piping shall be drilled to a size of minimum requirement for installation.
 - 3. For 16-gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 50,000 psi; ASTM A 653, A 570, or A 611.
 - 4. For 18-gage and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 653, A 570, or A 611.
 - 5. Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating.
 - 6. Fasteners: Provide nuts, bolts, washers, screws, and other fasteners with corrosion-resistant plated finish.
 - 7. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

2.03 FABRICATION

- A. General: Framing components may be prefabricated into assemblies before erection. Fabricate panels plumb, square, true to line, and braced against racking with joints welded. Perform lifting of prefabricated units to prevent damage or distortion.
- B. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.
- C. Fastenings: Attach similar components by screw fasteners. Attach dissimilar components

by bolting, or screw fasteners, as standard with manufacturer.

- D. Wire tying of framing components is not permitted.
- E. Welding of framing components is not permitted.
- F. Fabrication Tolerances: Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Bent, distorted or otherwise damaged components shall not be used.

3.02 INSTALLATION

- A. General: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations.
- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as specified on the structural drawings. Do not exceed 24 inches o.c. spacing for power-driven fasteners or 16 inches o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.
- C. Installation of Wall Studs: Secure studs to top and bottom runner tracks by screw fastening at both inside and outside flanges.
- D. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- E. Where stud system abuts structural columns or walls, including masonry walls, anchor end studs to stiffeners in supporting structure.
- F. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.
- G. Frame wall openings per structural drawings. Where details for openings are not provided, frame non-bearing wall openings smaller than 4 feet span with double 4" stud section header, single jamb stud, single king stud and single sill track. Frame openings larger than 4 feet span, but not exceeding 8 feet span, with double 6" stud section header, double

jamb studs, double king studs and single sill track. All structural bearing wall openings and non-bearing openings larger than 8 foot span require special details, see structural drawings.

- H. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.
- I. Install horizontal strap and block stiffeners in stud system where finish material is not installed to both sides, and where strap and block stiffeners are needed to maintain straightness of long studs. Space at not more than 96 inches o.c. vertically. See structural drawings for requirements.
- J. Erection Tolerances: Bolt wall panels (at both horizontal and vertical junctures) to produce flush, even, true-to-line joints.
 - 1. Maximum variation in plane and true position between prefabricated assemblies should not exceed 1/16 inch.
- K. Installation of Joists: Install level, straight, and plumb, complete with bracing and reinforcing as indicated on drawings. Provide not less than 1-1/2-inch end bearing.
 - 1. Drilled holes in un-punched joists shall be limited to a diameter of 1/3 joist depth and located within 1/3 joist depth within the center 1/3 joist span, unless otherwise approved by the engineer.
- L. Reinforce ends with end clips, steel hangers, steel angle clips, steel stud section, or as otherwise recommended by joist manufacturer.
- M. Where required, reinforce joists at interior supports with single short length of joist section located directly over interior support.
- N. Secure joists to interior support systems to prevent lateral movement of bottom flange.
- O. Field Painting: Touch-up damaged shop-applied protective coatings. Use galvanizing repair system for galvanized surfaces.

3.03 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated miscellaneous ferrous metal items, galvanized and prime painted, not included in Section 05 12 00, Structural Steel. Items include, but are not limited to, brackets, lintels, ladders, architectural features and similar items as indicated.
- B. Stainless steel metal items such as fascias, shade louvers, countertops and railings, not included in Section 05 12 00, Structural Steel.
- C. Related Sections:
 - 1. Section 05 12 00, Structural Steel Framing

1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME)
 - 1. ASME B18 Fasteners
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM A36/A36M Carbon Structural Steel
 - 2. ASTM A48/A48M Gray Iron Castings
 - 3. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless
 - 4. ASTM A123 Zinc (Hot-Dip Galvanized) on Coatings on Iron and Steel Products
 - 5. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 6. ASTM A276 Stainless Steel Bars and Shapes
 - 7. ASTM A283/A 283M Low and Intermediate Tensile Strength Carbon Steel Plates
 - 8. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - 9. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
 - 10. ASTM A513 - Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
 - 11. ASTM A563 - Carbon and Alloy Steel Nuts
 - 12. ASTM A653/A 653M Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - 13. ASTM A666 Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar (non magnetic).
 - 14. ASTM D520 - Standard Specification for Zinc Dust Pigment.
 - 15. ASTM A780 - Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - 16. ASTM C1107 - Packaged Dry Hydraulic – Cement Grout (Non-Shrink)
 - 17. ASTM F594 Stainless Steel Nuts
 - 18. ASTM F1554 - Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

- C. American Welding Society (AWS)
 - 1. AWS A2.4 - Standard Symbols for Welding, Brazing and Non Destructive Examination
 - 2. AWS A5.1 - Carbon Steel Covered Arc-Welding Electrodes
- D. California Code of Regulations (CCR)
 - 1. Title 8, Chapter 3.2
 - 2. Title 8, Division 1, Subchapter 7, Group 1, Article 4, Section 3277, Fixed Ladders
 - 3. Cal/OSHA, Subchapter 4 Construction Safety Orders
 - 4. 2019 California Building Code (CBC), Chapter 22.
 - 5. Title 12, California Fire Code Chapter 26 Welding and Other Hot Work.
- E. Steel Structures Painting Council (SSPC)
 - 1. SSPC SP-2 - Steel Preparation

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
 - 2. Structural steel primer paint.
 - 3. Shrinkage-resistant grout.
- C. Shop Drawings, including complete details and schedules for fabrication and assembly of structural steel members, procedures, and diagrams.
 - 1. Fabricator and detailer shall be responsible for coordination of all contract documents for required steel work. Comply with AISC – Code of Standard Practice for Steel buildings and Bridges, Section 4.
 - 2. Indicate welds by standard AWS symbols, Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories distinguishing between shop and field welds, and show size, length, and type of each weld. Include erection drawings, elevations and details where applicable. Indicate welded connections using standard AWS A2.4 Welding Symbols. Indicate net weld lengths.
 - 3. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other sections.
 - 4. Where drawings are in conflict, detailing shall not be completed for affected items until the detailer has requested clarification/revision from the Architect and has received written directive for such change as may be required. Request for clarification/revision shall be by RFI or by clouded comment on the initial shop drawing submittal. Fabricator shall be responsible for changes to the shop drawings required where shop drawings have progressed prior to resolution of discrepancies.
 - 5. Detailing shall allow for minor coordination changes and revisions as a part of the contract services.

- D. Welder Certifications (in accordance with AWS qualification requirements):
- E. Manufacturer's Certificates certifying welders employed on the work have been AWS qualified within the previous 12 months, in accordance with AWS-WHB-1.
- F. Written Welding Procedure Specification (WPS)
- G. Inspection reports conducted on shop and field High-Strength 'Slip Critical' bolted and welded connections: Include data on type(s) of tests conducted and test results.

1.04 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following
 - 1. AWS D1.1, Structural Welding Code--Steel.
 - 2. AWS D1.3, Structural Welding Code--Sheet Steel.
 - 3. AWS Certified welders.
 - 4. AWS D1.6, Structural Welding Code--Stainless Steel.
- B. Coating applicator - Galvanized Metal Fabrications: Company specializing in hot-dip galvanizing after fabrication and following the procedures in the *Quality Assurance Manual* of the American Galvanizers Association.

1.05 FIELD MEASUREMENTS

- A. Verify field measurements prior to submittal of shop drawings and fabrication.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

- A. Steel Sections: ASTM A992 for W-Shape sections and ASTM A36 for all other members.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Bending or cold-formed steel ASTM A283, Grade C.
- D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars ASTM A240, Type 304, Type 304L, Commercial Grade No. 4 finish, 16 gauge minimum, unless otherwise indicated. Stretcher-leveled standard of flatness for countertops.
- E. Stainless-Steel Bars and Shapes ASTM A276, Type 304L.

- F. Steel Round Structural Tubing ASTM A500, Grade B.
- G. Pipe ASTM A53, Grade B, Type E or S, Schedule 40, galvanized where indicated.
- H. Cast Iron ASTM A48/A48M, Class 30, unless another class is indicated or required by structural loads.
- I. Square and rectangular steel tubing structural, carbon steel conforming to ASTM A500.
- J. Mechanical Tubing: ASTM A 513 hot- or cold-rolled carbon steel for non-structural tubing, electric welded tubing.

2.03 FASTENERS

- A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563 and ANSI B18.2.1; and, where indicated, flat washers and ASTM A325 as indicated on drawings.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, nuts and, where indicated, flat washers; ASTM F593/(ASTM F738M) for bolts and ASTM F594/F836M) for nuts, Alloy Group (A1) (A4).
 - 1. Stainless Steel Fastenings and Fittings at Food Preparation areas
 - a. Bolts and screws with countersunk flat heads at interior and exterior visible or accessible surfaces.
 - b. Use concealed fastenings where possible.
- D. Anchor Bolts ASTM F1554, Grade 36.
- E. Machine Screws ASME B18.6.3.
- F. Lag Bolts ASME B18.2.1.
- G. Wood Screws Flat head, carbon steel, ASME B18.6.1.
- H. Plain Washers Round, carbon steel, ASME B18.22.1.
- I. Lock Washers Helical, spring type, carbon steel, ASME B18.21.1.
- J. Threaded rods, steel yokes and plates – ASTM A36.
- K. Self-drilling, self-tapping screws, ASTM C954, galvanized, minimum #10 unless noted otherwise on drawings. By Buildex/Tomarco or equal.
- L. Anchorage Devices, Drilled Expansion Anchors Minimum 5/8-inch diameter with 3 inch embedment unless noted otherwise on drawings. Allowable shear and tension values

as permitted in ICC-ES, ESR-1917 Hilti Kwik Bolt TZ Concrete Anchor or Hilti Kwik Bolt 3, ESR-1385 for masonry anchors, by Hilti Inc., Tulsa, OK.

2.04 MISCELLANEOUS MATERIALS

- A. Shop Primer Fabricator's rust inhibitive primer suitable for finish scheduled in Section 09 91 00.
- B. Galvanizing Repair Compound for metal to be painted: ASTM D520 Type III, "ultra pure" high purity grade. Touch-Up products for Galvanized Surfaces Ready mixed Zinc rich galvanizing compound, 95% zinc.
 - 1. Finish: ZRC Products Company, Marshfield, MA or equal. Primer for repaired galvanized to receive a painting finish.
- C. Zinc-Based Solders/Alloys for exposed galvanized finish: Solder Zinc Alloy for Repair ASTM A780 Annex A1; Welco Gal-Viz self-fluxing solder alloy, Galvalloy, Galvabar or equal, ASTM A780, paragraph A1. Repair Using Zinc-Based Alloys.
- D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. Welding Materials: AWS A5.1, E70XX for Grade 40, E90XX for Grade 60, type and procedures required by electrode manufacturer for materials being welded.
- E. Grout ASTM C1107, Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 8,000 psi at 7 days; of consistency suitable for application and a 30 minute working time.

2.05 FABRICATION

- A. Fit and shop assemble in largest practical sections for delivery to site.
- B. Identify those members specified as AISC-AESS (Architecturally Exposed Structural steel). Comply with AISC Section 10 for the fabrication of AESS steel.
- C. Ease exposed edges to small uniform radius.
- D. Fabricate items with joints tightly fitted and secured.
- E. Welded Joints. Seal joined members by continuous welds. Dress welded joints, leaving no burrs, or sharp or abrasive corners, edges or surfaces.
 - 1. Where exposed to view in finished, interior and exterior habitable spaces, dress welds in accordance with NOMMA Guidelines for Finish 1.
 - 2. Where exposed to view in utility type spaces and roof tops, dress welds in accordance with NOMMA Guidelines for Finish 2.
 - 3. Where concealed, dress welds in accordance with NOMMA Guidelines for Finish 3.
 - 4.
- F. Exposed Mechanically Fastened Joints. Make exposed, mechanically fastened joints hairline-tight, flush, butt joints. Secure with flush-mount, countersunk, screws or bolts;

unobtrusively located; consistent with design of component, except where specifically indicated otherwise.

- G. Provide components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as related metal fabrication, unless expressly indicated otherwise.
- H. Stainless Steel Countertops
 - 1. Fabricate from 0.060-inch, minimum, Type 304 stainless steel sheet
 - 2. Exposed surfaces and edges shall have No. 4 (satin) finish.
 - 3. To the extent practicable, fabricate tops in a single piece for each run of casework. Do not locate needed joints within 30-inches of a sink.
 - a. Factory joints: electrically welded, ground smooth and finished to match exposed top surface.
 - b. Field joints: not permitted within openings and serving areas.
 - c. Fabricate field joints to be mechanically cinched with continuous splines and draw bolts resulting in flat level surfaces and a hairline-tight seam, supported the full length of joint.
 - 4. Fabricate tops to be installed without field cutting or drilling. Take measurements at the Site and coordinate fabrication with related casework.
 - 5. Back and end splashes shall be 4-inches high, unless expressly indicated otherwise, and shall meet horizontal surface of top with integral, coved joint. Form tops and backsplashes from single sheet of metal.
 - 6. Reinforce tops with continuous stainless steel channels welded to the underside along length to prevent twisting, oil canning, or buckling of surface. Reinforce tops at the perimeter of sinks.

2.06 FINISHES

- A. Steel and Iron
 - 1. Clean surfaces of rust, scale, grease and foreign matter prior to finishing. Prepare in accordance with SSPC SP-2. Dress all welds.
 - 2. Galvanize steel items indicated to zinc coating thickness in accordance with ASTM A123, minimum Coating Grade 80 (1.9 oz/sq. ft.). Surfaces shall be free of icicles, spangles and puddling. Provide venting holes at all enclosed sections, "V" notch, and drilled holes are acceptable. Locate to prevent rainwater from entering enclosed sections at exterior galvanized items. For sheet steel items, galvanize per ASTM A653 G60 Coating Designation.
 - 3. Galvanized items to be painted: Do not use quenching solutions or treatments immediately after galvanizing. Refer to individual sections for galvanized items to be painted and to Section 09 91 00.
 - 4. Do not prime surfaces in direct contact with concrete or where field welding is required.
 - 5. For painted surfaces, prime items with two coats in accordance with requirements of primer specified herein and as required to prevent steel items exposed to elements from rusting prior to application of finishes.
- B. Stainless Steel Finishes
 - 1. Remove tool and die marks and stretch lines or blend into finish.
 - 2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of individual pieces, except adjacent lapped or abutted pieces

that form a larger panel shall have the grain running in the same direction as directed by Architect.

3. Bright, Directional Satin Finish No. 4.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on shop drawings.
 1. Weld joints using shielded metallic electric arc (SMAW) method. Use coated welded rods, not fluxed, or type recommended by manufacturer for use with parent metal. Use only certified welders for structural construction.
 2. Grinding: Grind welds on surfaces subject to traffic or contact to smooth flush joints (prior to galvanizing or priming).
 3. Peening: Remove flux and weld spatter as necessary to eliminate unsightly conditions and grind off sharp projections.
 4. Permanently Concealed Welds: No treatment required other than preparation for painting or galvanizing.
- D. Perform field welding in accordance with AWS standards and procedures for metal alloy welded.
- E. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions and surfaces not shop primed or that are damaged during erection, except surfaces to be in contact with concrete.
- G. Repair of Galvanized Surfaces to be Painted: Ready mixed, zinc-rich galvanizing compound, ASTM D520, ASTM A780 - A2. Repair Using Paints Containing Zinc Dust, minimum thickness 5 mils.

- H. Repair of Galvanized Surfaces to be Exposed: ASTM A782 Annex A1, apply Gal-Viz while metal is still hot. Tin surface with Gal-Viz with wire brush. Do not direct flame on alloy. Minimum thickness, 5 mils.

3.04 ERECTION TOLERANCE

- A. Maximum Variation From Plumb: 3/16 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 3/16 inch, non-cumulative.

3.05 FINISHES

- A. Paint with Gloss Polyurethane High Performance Coatings in Special Coatings per Section 09 91 00 Painting.

3.06 SCHEDULE

- A. Schedule is a list of principal items only. Refer to Drawing details and other specification sections for items not specifically scheduled including various miscellaneous steel angles pipes, threaded rods, tubes and similar shapers used for brackets, clips and supports for various items located throughout.
- B. Fasteners: Provide sufficient fasteners and connectors of approved types, whether indicated or not for solid secure attachment and installed in straight lines of uniform pattern. Match finish of steel unless otherwise indicated.
- C. Interior Vertical Access Ladder: as detailed in drawings for field painting.
- D. Steel Backing Plates 1/4 inch thick x widths and lengths required to support wall bumper, plumbing fixture hanger, equipment and as detailed. Cope wood studs and screw plates flush to surface with No. 14 x 2 1/2" wood screws at top and bottom of each stud (16" o.c. max.).
- E. Railing and Handrails as detailed:
 - 1. Galvanized Finish steel pipe and brackets at exterior stairs, ramps and landings where indicated in drawings.
 - 2. Steel pipe guardrails primed for field painting at interior stairs, ramps and landings where indicated in drawings.
- F. Stainless Steel fabrications: 16 gauge Countertops from formed sheet metal and 16 gauge stainless steel wall armor and corner guards. Profiles, shapes, and sizes as indicated in drawings.
- G. Steel brackets and supports for counter tops as detailed.
- H. Steel framing and support for plumbing, mechanical and/or electrical equipment.

END OF SECTION

SECTION 05 51 33
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 roof access cage ladders.
- B. Related Sections:
 - 1. Division 05 Section "Metal Fabrications" for fasteners and installation requirements used to attach ladders to structure.

1.3 PERFORMANCE REQUIREMENTS

- A. 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.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal ladders 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.

1.4 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, and finishes.
- C. Shop Drawings: Include plans, elevations, sections, and details of ladders and their connections. Show anchorage to adjoining Work.
- D. Samples for Initial Selection: For each finish specified, two complete sets of color chips representing manufacturer's full range of available colors.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Ladders shall comply with ANSI A14.3 and OSHA 1910.27.
- B. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
- C. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 WARRANTY

- A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years commencing on the shipment date of the product against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
 - 1. Defects in materials and workmanship.
 - 2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.
 - 3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.
- B. Manufacturer shall be notified immediately of defective products, and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor. Manufacturer makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of the ladder; and shall not be liable for incidental or consequential damages, losses of or expenses, resulting from the use of ladder products.

1.8 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.

1.9 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 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. Nonferrous 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.

2.2 ALUMINUM LADDERS

- A. Basis of Design: Drawings and Specifications are based on the following:
 - 1. Interior Roof Access Ladders: O'Keeffe's Inc.; Model 532 Low Parapet Access Ladder with Roofover Rail Extensions.
 - 1) Subject to compliance with requirements, provide product indicated or a comparable product subject to Request for Substitution.
- B. 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 1,500 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.
4. Ladder Safety Post: Retractable hand hold and tie off.
5. Safety Cages:
 - a. Fabricate ladder safety cages to comply with authority having jurisdiction. Assemble by welding. Spacing of primary hoops, secondary hoops and vertical bars shall not exceed that required by code.
 - b. Safety cage hoops and vertical bars: 3/16 inch (5 mm) by 2 inches (51 mm) aluminum bar.

2.3 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. Coordinate anchorages. Furnish setting drawings, templates, and anchorage structural loads for fastener resistance.
- B. Examine substrates, areas, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- C. Examine wall framing for backing to verify actual locations before ladder installation.
- D. 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 05 73 16

CABLE RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum railings with cable infill.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 05 12 13 - Architecturally-Exposed Structural Steel Framing.

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A21.1 - Safety Requirements for Floor and Wall Openings, Railings and Toe Boards.
 - 2. ANSI A58.1 - Minimum Design Loads in Buildings and Other Structures.
 - 3. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- B. American Welding Society (AWS):
 - 1. AWS Specifications for Welding Rods and Bare Electrodes.
- C. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- D. ASTM International (ASTM):
 - 1. ASTM A 47 - Specification for Ferritic Malleable Iron Castings.
 - 2. ASTM A 269 - Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - 3. ASTM A 276 - Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
 - 4. ASTM A 312 - Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
 - 5. ASTM A 554 - Welded Stainless Steel Mechanical Tubing
 - 6. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 7. ASTM A1264-1 - Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems
 - 8. ASTM B 221 Specification for Aluminum-Alloy Bars, Rods, Wires, Shapes and Tubes.
 - 9. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
 - 10. ASTM E 894 - Standard Test Methods for Anchorage of Permanent Metal Railing Systems and Rails for Buildings.
 - 11. ASTM E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
 - 12. ASTM E 985 - Specification for Permanent Metal Railing Systems and Rails for Buildings.
- E. National Association of Architectural Metal Manufacturers (NAAMM) and National Ornamental and Miscellaneous Metals Association (NOMMA):
 - 1. NAAMM Metal Finishes Manual.
- F. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. NAAMM Pipe Railing Manual.
 - 2. NAAMM Metal Stair Manual.

- G. National Fire Protection Association (NFPA):
 - 1. 101 - Life Safety Code.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Handrails and railings shall withstand structural loading as determined by allowable design working stresses of materials.
- B. Structural Performance: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections.
 - 1. Components and installation shall be in accordance with state and local code authorities.
 - 2. Components and installation shall follow current ADA and ICC/ANSI A117.1 guidelines.
 - 3. Top Rail: Shall withstand the following loads.
 - a. Concentrated load of 200 lb (0.89 kN) applied at any point and in any direction.
 - b. Uniform load of 50 lb/ft. (0.07 kN-m) applied horizontally and concurrently with uniform load of 100 lb/ft. (0.14 kN-m) applied vertically downward.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 - 4. Handrails Not Serving as Top Rails: Shall withstanding the following loads.
 - a. Concentrated load of 200 lb (0.89 kN) applied at any point and in any direction.
 - b. Uniform load of 50 lb/ft. (0.07 kN-m) applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
 - 5. Guard Infill Area: Shall withstand the following loads.
 - a. Concentrated horizontal load of 200 lb (0.89 kN) applied to 1 square foot (0.09 m²) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Loads need not be assumed to act concurrently with loads on top rails in determining stress on guard.
- C. Thermal Movements: Handrails and railings shall allow for movements resulting from 120 deg F (49 deg C) changes in ambient and 180 deg F (82 deg C) surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- D. Corrosion Resistance: Separate incompatible materials to prevent galvanic corrosion.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including, but not limited to, the following:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Grout, anchoring cements and paint products.
- C. Shop Drawings: Submit shop drawings showing fabrication and installation of handrails and railings. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Provide setting diagrams for installation of anchors, location of pockets, weld plates for attachment of rails to structure, and blocking for attachment of wall rail.
 - 2. Indicate all required field measurements to be held.
 - 3. Indicate materials, sizes, styles, fabrication, anchorage and installation details for railing system and infill.

- D. Certifications:
 - 1. Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.
- E. Samples:
 - 1. Post and rail sections, minimum 4 inch (100 mm) long piece of each type.
 - 2. Infill Cable: Minimum 8 inch (200 mm) long piece with end fittings.
 - 3. Verification Samples: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - a. 6 inches (152 mm) long sections of each different linear railing member, including handrails and top rails.
- F. Quality Control Submittals:
 - 1. Certificates: Submit certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of aluminum handrails and railings of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 5 years.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction.
- C. Installer Qualifications: Minimum 2 years experience installing similar systems.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Install one complete railing including infill panel at location selected by Architect.
 - 2. Obtain Architect's approval prior to installing additional railings.
 - 3. Refinish mock-up area as required to produce acceptable work.
 - 4. Approved sample may remain as part of completed work.
- E. Pre-Installation Meeting:
 - 1. Prior to the beginning of work, conduct a pre-job conference at the job site.
 - 2. Provide seven calendar days advance written notice ensuring the attendance by competent authorized representatives of the fabricator, building owner's representative, architect and subcontractors whose work interfaces with the work of this section.
 - 3. Review the specifications to determine any potential problems, changes, scheduling, unique job site conditions, installation requirements and procedures and any other information pertinent to the installation.
 - 4. Record the results of the conference and furnish copies to all participants.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 WARRANTY

- A. Special Warranty: Provide manufacturer's standard form outlining the terms and conditions of their standard Limited Warranty:
 - 1. Cable and Connectors: 10 year limited warranty against defects in materials and workmanship.
 - 2. Paint Finish on Aluminum Extrusions and Components: 10 year limited warranty against cracking, flaking, blister, and peeling.
- B. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Stainless Cable & Railing Inc., which is located at: 3315 N.E. 112th Ave. Suite 73; Vancouver, WA 98682;
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 ALUMINUM RAILINGS WITH CABLE INFILL

- A. Aluminum Railings with Cable Infill.
 - 1. Mounting: Top (Deck) Mounted Posts.
 - 2. Mounting: Core Mounted Posts.
 - 3. Rail Height: 42 inches (1067 mm).
 - 4. Top Rail Type: Wood.
 - 5. Foot Rail / Handrail Type: Aluminum Post-To-Post (stand alone).
 - 6. Base Plate: 5.25 x 5.25 x 0.35 inches (133 x 133 x 9 mm) minimum.
 - 7. Anchor Bolts:
 - a. 3/8 inch (9.5 mm) diameter Redhead ITW wedge, with minimum 4 inch embedment.
- B. Square Extruded Aluminum Components: Provide manufacturer's standard extruded aluminum components as follows:
 - 1. Intermediate Post (Standard): 2.362 inches (60 mm) by 2.362 inches (60 mm) with radiused corner, 0.079 inch (2 mm) wall thickness.
 - 2. Terminal (Standard) Post: 2.362 inches (60 mm) by 2.362 inches (60 mm) with radiused corners, 0.079 inch (2 mm) wall thickness on two opposing sides and 0.28 inch (7 mm) wall thickness on two other sides.
 - 3. Cable Assemblies: 3/16 inch (4.8 mm) 1x19 fittings to be sized according to cable diameter. Fittings to be 316 measure grade stainless.
- C. Aluminum Finish: NAAMM/NOMMA Metal Finishes Manual. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 1. Clear Anodized Finish: AA-M10-C22-A31 (204R1).

2.3 CABLE RAILING COMPONENTS

- A. Cables:
 - 1. Material: 1 x 19, Type 316 stainless steel strand, left-hand lay, per dimensional properties contained in MIL-DTL-87161.
 - 2. Finish: Mill.
 - 3. Diameter: 3/16 inch (5 mm), minimum breaking strength of 4000 pounds.

4. Spacing: Maximum 3 inches (76 mm) on center.
 5. Cable Hardware Components:
 - a. Material: Stainless steel, ASTM A276 and A479, SAE/AMS QQ-S-763, Type 316.
 - b. Include washers, nuts, end caps and any accessory items as recommended by manufacturer for installation conditions or as shown on Drawings.
 - c. Type: Use hardware substantially concealed inside end posts wherever practical.
 - d. Field Assembly: Field Threaded Tensioner/Field. Threaded Terminal/Acorn Nut, Hex Nut, & Stainless Washer or Cable Quick Nut & Cover.
 - e. Cable Quick Lock Swageless Assembly Type 1: Field Threaded Tensioner/Cable Quick Lock Swageless Receiver/Cable Quick Nut Connector/Cable Quick Nut & Cover.
 - f. Cable Quick Lock Swageless Assembly Type 2: Cable Quick Lock Swageless Receiver/Terminal Hex Bolt/Cable Quick Receiver & Stud.
 - g. Low Profile Assembly: Cable Quick Terminal/Terminal Hex Bolt/Cable Quick Receiver & Stud.
- B. Handrail Brackets
1. Aluminum; cast
- C. Fasteners:
1. Handrail Anchors: Select fasteners of type, grade and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
 2. Handrail and Railing Component Anchors: Use fasteners fabricated from same basic metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 - a. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are standard fastening method for handrail and railing indicated.
 - b. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

2.4 FABRICATION

- A. Fabricate handrails and railings by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- B. Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.
- C. Provide inserts and other anchorage devices to connect handrails and railings to concrete or masonry. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- D. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- E. Cut, reinforce, drill, and tap components as indicated on the Drawings to receive finish hardware, screws, and similar items.
- F. Close exposed ends of railing members with prefabricated end fittings.
- G. Provide mounted handrail wall returns at wall ends unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
 - 1. Examine substrates to receive anchors verifying that locations of concealed reinforcements have been clearly marked for the Installer. Locate reinforcements and mark locations if not already done.
 - 2. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchors, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the Project site.

3.3 INSTALLATION

- A. General: Install components in accordance with manufacturer's instructions and in proper relationship with adjacent construction.
 - 1. Fitting: Fit exposed connections together to form tight, hairline joints.
 - 2. Cutting and Placement: Set handrails and railings accurately in location, alignment, and elevation measured from established lines and levels and free from rack.
 - a. Do not weld, cut, or abrade coated or finished surfaces of railing components that are intended for field connection by mechanical or other means without further cutting or fitting.
 - b. Align rails so variations from level or parallel alignment do not exceed 1/4 inch in 12 feet (1.6 mm per m).
 - c. Provide manufacturer's proprietary system to evacuate entrapped water in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources, in order to prevent water from entering the concrete slab. In lieu of the manufacturer's proprietary system, if acceptable to the Architect, provide another means to evacuate the entrapped water, i.e., a weep hole and epoxy fill system ("drill-and-fill").
 - d. Anchor posts in concrete with pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, solidly fill annular space between post and sleeve with non-metallic, non-shrink grout, mixed and placed to comply with anchoring material manufacturer's directions.
 - e. Anchor posts in concrete by forming or core drilling holes not less than 5 inches (127 mm) deep and 3/4 inch (19 mm) greater than outside diameter of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-metallic, non-shrink grout, mixed and placed to comply with anchoring material manufacturer's directions.
 - f. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8 inch (3 mm) buildup, sloped away from post.
 - g. 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.
 - h. Adjusting: Adjust handrails and railings before anchoring to ensure alignment at abutting joint's space posts at interval indicated, but not less than required to achieve structural loads.
 - i. Fastening to In-Place Construction: Use anchorage devices and fasteners

where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

- B. Non-Welded Railings Connections: Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings.
- C. Metal Interaction:
 - 1. When aluminum components come into contact with dissimilar metals, surfaces shall be kept from interacting through painting the dissimilar metal with a heavy coat of a proper primer. The use of plastic grommets and/or PVC sleeves is encouraged to prevent contact between stainless steel cables and aluminum hole edges.
 - 2. When aluminum components come into contact with cement or lime mortar, exposed aluminum surfaces shall be painted with water-white methacrylate lacquer.

3.4 ADJUSTING AND CLEANING

- A. Touch-Up Painting: Immediately after erection, and abraded areas of shop paint, and appoint exposed areas with same material.
- B. Passivation: Immediately after erection, spray passivation solution on stainless steel frame pieces and cables to restore protective layer. Use Boeshield T9 in marine environments for additional protection.
- C. Cleaning: Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

3.5 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to the Installer that shall ensure that the aluminum handrails and railings shall be without damage at time of Substantial Completion.
- B. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
- C. Protect stainless steel from corrosion and staining by applying passivation solution following installation and periodically thereafter. Use Boeshield T9 in addition to passivator in marine environments.
- D. Protect wood products from fading, checking, splitting, etc. with proper end grain sealant and oil treatment.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Rough carpentry.
- B. Related Section:
 - 1. Section 01 35 43, Special Environment Requirements.

1.02 REFERENCES

- A. Chapters 7 and 23, 2019 CBC.
- B. ANSI/AWC HDS - 2012.
- C. DOC PS 1 - Department of Commerce Product Standard, U. S. Product Standard for Construction and Industrial Plywood.
- D. DOC PS 20 - Department of Commerce Product Standard, American Softwood Lumber Standards.
- E. DOC PS 2 - Department of Commerce Product Standard, U. S. Product Standard for Construction, Performance Standard for Wood-Based Structural-Use Panels.
- F. ANSI A135.4 - Basic Hardboard.
- G. WWPA - Western Lumber Grading Rules 88, Latest Edition, by Western Wood Products Association.
- H. APA - American Plywood Association Design/Construction Guide (Engineered Wood Association).
- I. AQMD - Local Air Quality Management District Regulations.
- J. AWWA U1 - Use Category System: User Specification for Treated Wood.
- K. WCLIB - West Coast Lumber Inspection Bureau Standard Grading Rules No. 17.
- L. Title 8 - California Code of Regulations, Construction Safety Orders.
- M. ICC –ES – International Code Council Evaluation Service, Inc.
- N. RIS – Redwood Inspection Service, Standard Specifications for Grades of California Redwood Lumber.
- O. FSC – Forest Stewardship Council Principles and Criteria.

1.03 SUBMITTALS

- A. Product data and current ICC-ES Reports for framing anchors.

1.04 QUALITY ASSURANCE

- A. Rough Carpentry Lumber: Visible grade stamp on all products required.
- B. Grade Stamp: Association under whose rules it was graded, or official grade mark of other recognized grading agencies using grading rules, equivalent to WWPA or WCLIB.
- C. Association performing grading and grade marking of lumber shall be approved by Division of the State Architect (DSA).
- D. Nailing guns and nail operators shall be approved in accordance with Title 8 Construction Safety Orders.
- E. All Plywood shall be free of urea-formaldehyde binders and adhesives.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver rough carpentry items until site conditions are adequate to receive the Work. Protect items from weather while in transit.
- B. Store lumber and plywood at the site under cover or otherwise protected against exposure to weather, raise above ground and out of contact with damp or wet surfaces. Stack lumber and plywood and provide for air circulation within and around stacks and under temporary covers. For pressure treated lumber and plywood, provide spacers between courses to permit air circulation.
- C. Certified wood shall be kept separate from non-certified wood. Auditing process as mandated by certifiers shall be complied with.

1.06 PROJECT CONDITIONS

- A. Cooperate with other trades in coordinating their Work with the Work of this Section. Provide wood grounds, blocking and nailer where indicated or as required for Work of other trades.

PART 2 - PRODUCTS

2.01 ROUGH CARPENTRY MATERIALS

- A. Lumber: Graded in accordance with WWPA or WCLIB; maximum moisture content of 19 percent at time of loading. Provide Douglas Fir Larch for structural and framing lumber, surfaced four sides to standards of the grading association unless otherwise indicated on Drawings, use the following grades
 - 1. Joists, rafters, beams, lintels, horizontal framing, posts, studs and vertical framing: Species and grades as indicated or noted on drawings.

2. Non-bearing studs and plates, non-structural furring, concealed blocking, stripping and miscellaneous nailers and backing: No. 2 unless noted otherwise in the structural drawings.
 3. Structural Drawings take precedence for lumber grades.
 4. All lumber in contact with concrete shall be pressure treated.
- B. Shop Fabricated Structural Wood:
1. LSL: Where indicated, use Timberstrand material per ICC ESR-1387 – Fb = 2600 psi, Fv = 400 psi, E = 1.7×10^6 , or approved equal. (Approved substitutes shall have ICC approval.)
 2. PSL: Where indicated, use Parallam material per ICC ESR-1387 – Fb = 2700 psi, Fv = 260 psi, E = 1.9×10^6 , or approved equal. (Approved substitutes shall have ICC approval.)
 3. LVL: Where indicated, use Microllam material per ICC ESR-1387 – Fb = 2600 psi, Fv = 285 psi, E = 1.9×10^6 , or approved equal. (Approved substitutes shall have ICC approval.)
- C. Plywood (Wood Structural Panels): Section 2303.1.5 CBC, Douglas Fir 1 Group Species, PS 1, APA Structural I Rated Sheathing. Bond Classification: Exterior. Thickness as indicated, span rating sized for spacing.
1. For natural finished plywood: Panel Grade N veneer on face and B on back side.
 2. For painted finish: APA Sanded Plywood Panels, A-C Group 1, Exterior, sanded face, touch sanded back side.
 3. Thickness: Minimum 15/32 inch for walls and 19/32 inch for roof, or as indicated on Drawings.
 4. Plywood shall be FSC certified; other sustainable forestry certifications will not be accepted.
- D. Oriented Strand Board (OSB): PS 2, APA PRP-108, 15/32 inch through 3/4 inch APA Rated Sheathing and Structural 1 Rated Sheathing, Exposure 1, meeting NES "Oriented Strand Board Roof and Wall Sheathing, Combination Subfloor/Underlayment OSB Lap and Panel Siding (NER-124)".
- E. Preservative (Pressure) Treated Lumber: Section 2303.1.9 Conform to AWP Manual of Recommended Practice, kiln dry after treatment. Use preservative complying with AWP U1, latest edition. Products NOT containing arsenic or chromium. Conform to AQMD, Local Regulations.
1. Douglas Fir Larch, used as required by Section 2303, CBC, shall conform to the following
 - a. Lumber shall be WWPA or WCLIB grade stamped.
 - b. Lumber shall be No. 1 grade or better unless indicated otherwise on Drawings.
- F. Waterproof Membrane: ASTM D4601; Type II, asphalt saturated glass felt.
- G. Fire-Retardant Treated Wood: Section 2303.2 CBC
1. Fire-Retardant Douglas Fir Lumber: Lumber shall be grade stamped by an approved agency at the factory, and shall bear identification indicating the fire performance rating thereof, Flame Spread Less than 25, ASTM E84. Lumber: AWP C20.

2. Fire-Retardant Treated Douglas Fir Plywood: AWP Standard C-27, NFPA 703, ASTM D-5516, ASTM E-84, Section 2303.2, CBC, PS 1-09, APA structural rated sheathing, Exposure 1, 5/8 thick. Plywood shall comply with the following Maximum Flame Spread Classifications in the following locations
- H. Plywood Backing Panels
1. Telephone and Electrical Equipment, fixed equipment, cabinets, grab bars, door stops and plates: DOC PS 1, Exposure 1, APA A-C, sanded, Veneer Grade, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1 inch nominal thickness. Installed "A" side out for paint finish.
- I. Nails, Spikes and Staples: Section 2303.6 and 2304.10 CBC, Hot-Dipped Zinc Coated Galvanized for exterior exposed applications, high humidity locations and installation into treated wood and within 8" of soil or exterior slabs; plain finish for other interior locations; size and type to suit application. Comply with Table 2304.10.1. Use common nails only.
- J. Bolts, Nuts, Washers, Lags, Pins and Screws: Section 2304.10 CBC, sized to suit application, galvanized for exterior locations, high humidity locations and treated wood, plain finish for other interior locations. Full diameter body bolts only per ASME B18.2.1(.2) or B18.2.6 for structural applications.
- K. Fasteners: Expansion type or powder actuated type for anchorage to solid masonry or concrete. Refer to Division 01, General Requirements for acceptable types and required testing. Where installation and torque verification of wedge-type anchors is inspected by the IOR, testing of anchors will not be required unless directed by the SEOR for structural tension applications.
- L. Stock Framing Connectors: Section 2304.10 CBC types indicated on Drawings, galvanized, with nails fully driven in all holes in each face of connector. Conform to the following.
1. Manufacturers: Simpson Strong Tie Co., Inc., San Leandro, CA, United Steel Products, Montgomery, MN. or equal as approved in accordance with Division 01 General Requirements for Substitutions.
 2. ICC Listed.
- M. Non-Stock Framing Connectors: Conform to details. No substitutions allowed.
- N. Nonshrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 24 hours and 8,000 psi in 7 days; of consistency for application and a 30 minute working time. Acceptable Manufacturers: Dayton Superior, Miamisburg, OH; Sonneborn, Shakopee, MN; Novex Systems International, Clifton NJ, or equal.
- O. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- P. Adhesives: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.01 LAYOUT MARKINGS

- A. Layout markings shall not be made with xylene-based inks, paint, or dyes, or with other solvent-based products that may bleed through finishes.

3.02 FRAMING, FURRING AND STRIPPING

- A. Erect wood framing, furring, stripping and nailing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch in 10 feet, non-cumulative.
- B. Construct members of continuous pieces of longest possible lengths.
- C. Construct and erect required headers and lintels.
- D. Use multiple wall framing members at openings as indicated on structural drawings. Space short members above and below openings in same manner as for walls.
- E. Provide double joist headers at joist ends and around openings unless otherwise indicated on Drawings. Bridge joists and rafters to conform Section 2304 CBC and as noted on plans. For pre-manufactured joists, provide bridging in accordance with manufacturer's recommendations.
- F. Construct walls with studs of size spacing indicated, 16 inches on center unless otherwise indicated on drawings. Install single sill member at bottom and double plate at top. Stagger upper and lower members of double plate with joints not less than 4 feet o.c. or as indicated on Drawings. Where sill or any wood member contacts concrete or masonry within 8" of soil or exterior slab or setting on interior slab, install preservative-treated lumber.
- G. Provide one row of solid blocking not less than 2 inch nominal thickness and same width of stud at ceiling and floor lines and at spacing not to exceed 8 feet on center vertically. Fit snugly and attach with not less than two 10d nails.
- H. Install 3 studs at corners unless otherwise indicated. Accommodate corner holdown attachments where they occur. Conform to structural drawing requirements for limits of cutting, notching and boring of sills, plates, studs, joists and beams.
- I. Conform to Section 717, California Building Code for fire blocks and draft stops. Fire blocks and stops at 10-foot intervals and at ceiling level.
- J. Fire-Retardant Wood: Ripping and milling are not permissible. Cross cutting to length, drilling holes, joining cuts and light sanding are permissible. It is not necessary to field treat cut ends to maintain flame spread rating. All cuts on plywood are considered end cuts and is permissible to be cut.

3.03 PLYWOOD SHEATHING

- A. Thickness as indicated on the Drawings, minimum thickness 15/32 inch.

- B. Nailing: of size and spacing indicated. Common wire only unless indicated use hot-dipped zinc coated galvanized in treated wood or wood within 8" of soil or exterior slabs.
- C. Boundary Nailing: Not less than 3/8 inch from edge, spaced not more than 6 inches on center, unless noted otherwise on Drawings.
- D. Blocking: Panel edges shall bear on framing members or solid blocking.
- E. Minimum Size Vertical Panel: 16 inches wide.
- F. Minimum Size Horizontal Panel: 24 inches wide.
- G. Oriented Strand Board not permitted for shear panels unless indicated on structural drawings.

3.04 FOUNDATION FRAMING, PLATES, SILLS AND SLEEPERS

- A. Preservative treated wood required. Set wood sills on a bead of continuous butyl sealant on both edges of sill.
- B. Use hot-dipped zinc coated galvanized nails in treated wood and wood within 8" of soil or exterior slabs.

3.05 HORIZONTAL FRAMING

- A. Bearing: 1-1/2 inch minimum on wood or metal, 3 inches on masonry unless otherwise detailed on drawings. Lay framing members with crown up. Members with knots at bottom not permitted.
- B. Lateral Support: Use solid blocking, cross bridging or other approved means.
- C. Do not run joists continuous beyond one span unless indicated otherwise on Drawings.
- D. Openings: Frame openings in walls as specified on the structural drawings.
- E. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.06 INSTALLATION OF BACKBOARDS

- A. Provide backing panels as indicated on Drawings to support telephone and electrical equipment, fixed equipment, cabinets, grab bars, door stops and plates. Fasten securely to framing. Ensure that backing panels are installed with good side out (whose face side is free of blemishes) side by side, no mix of sides permitted.
- B. Install to extent indicated on the drawings or as required for electrical or communication system installation.
- C. Install with sheet metal screws, No.10 minimum, at 12 inches on center minimum. Drywall screws will not be permitted.

- D. Prime paint exposed faces. Do not cover manufacturer's trade stamps indicating fire treatment.
- E. Final finish per Section 09 90 00, Painting.

END OF SECTION

SECTION 06 18 00

STRUCTURAL GLUED LAMINATED UNITS

PART 1: GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to this section.

1.02 SUMMARY

- A. Glued laminated (Glulam) timber is defined to include wood members fabricated from 2 inch nominal thickness lumber, glued face-to-face to a depth of four or more laminations.
 - 1. Provide connectors, anchors, and accessories necessary to interconnect and secure Glulam members to building structure, and their installation.
- B. The types of structural glued laminated units specified in this section include:
 - 1. Straight beams, including girders and purlins, and cambered members.
 - 2. Beams of the following species: Douglas-Fir, Alaskan Cedar.

1.03 SUBMITTALS

- A. Product data including specifications and installation instructions covering lumber, adhesives, fabrication process, preservative treatment, accessories and protection.
 - 1. Submit certification signed by an officer of the fabricating firm indicating glued laminated timbers comply with requirements of ANSI/AITC A190.1.
- B. Shop Drawings showing full dimensions of each member and layout of entire structural system. Indicate species and laminating combination, adhesive type, cambers and other variables in required work.

1.04 QUALITY ASSURANCE

- A. Standards: Comply with ANSI/AITC A 190.1 "Structural Glued Laminated Timber".
- B. Manufacturer Qualification: Provide factory-glued structural units, produced by an AITC-licensed firm, qualified to apply the AITC "Quality Inspected" mark.
- C. Factory mark each piece of glued laminated structural units with AITC Quality Inspected mark.
 - 1. Place AITC mark on timber surfaces, which will not be exposed, in completed work.

- D. Installer: Firm which has demonstrated competence specializing in installation of glued laminated timber for at least 5 years.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Keep glued laminated structural units dry during delivery, storage, handling, and erection, by maintaining factory-applied protective covering in weather tight and light-proof condition, or by applying other weather tight protection. Maintain protective covering until building enclosure is completed to extent necessary for protection of interior Glulam work, and until final finishing of exterior work is ready to proceed. Do not store Glulam units in areas of either excessively high or excessively low relative humidity; comply with manufacturer's instructions.
- B. Time delivery and installation of Glulams to avoid extended on-site storage, and to avoid delaying other trades whose work must follow erection of Glulams.
- C. If laminated units are to be stored before erection, place individual units or bundle wrapped units on blocks well off ground with individual members separated for air circulation. Leave wrappings intact, but slit or puncture lower side to permit drainage of water, which may accumulate.

PART 2: PRODUCTS

2.01 STRUCTURAL GLUED LAMINATED UNITS

- A. Lumber: Comply with ANSI/AITC A190.1 and applicable lumber association standards cited therein for grades required to achieve Glulam requirements for design values, appearance, fabrication limitations and species (if any). See drawings for sizes, lamination combinations, and stress values.
- B. Lumber Species:
Interior, not exposed to view: Douglas Fir-Larch – Commercial appearance.
Interior, exposed to view and all exterior: Alaskan Cedar – Architectural appearance.
- C. Adhesive: ANSI/AITC A190.1, "wet-use" type.
- D. End Sealer: Manufacturer's standard transparent, colorless wood sealer, effective in retarding transmission of moisture at cross- grain cuts.
- E. Penetrating Sealer: Manufacturer's standard translucent penetrating wood sealer, which will not interfere with application of wood stain and transparent finish, or paint finish, as indicated.
 - 1. Refer to Division 9 sections for required field-applied finishes.
- F. Connectors, Anchors, Accessories: Provide fabricated steel (ASTM A 36) shapes, plates and bars, welded into assemblies of types and sizes indicated. Provide steel bolts (ASTM A 307), lag bolts, nails, and other standard fasteners as required for installation.
 - 1. Exposed to View Finish: Hot-dipped galvanized. Refer to Section 05 50 00 Metal Fabrications.

2. Hidden to View Finish: Finish fabricated assemblies with rust-inhibitive primer, unless otherwise indicated.

2.02 FABRICATION

- A. General: Comply with ANSI/AITC A190.1 and ASTM D 3737 in providing units indicated; where dimensions are not completely documented, provide manufacturer's standard sizes and shapes required to fulfill indicated performances.
 1. Shop-fabricate for connections and connecting hardware to greatest extent feasible, including drilling of bolt holes.
 2. All laminated units shall be marked to clearly identify the "TOP" of beam for proper installation.
- B. Testing and Inspection: Comply with Inspection Manual AITC 200. Inspection certificates shall be submitted with all glued laminated units.
- C. Camber: The required camber for fabrication of each member is shown on drawings, and may be either circular or parabolic, at manufacturer's option. Unless otherwise indicated, all single-span members shall be cambered to a +1600 ft. radius. Where manufacturer's standard fabrication camber is other than 1600 ft. radius, beams shall be manufactured to provide the equivalent of a 1600 ft. radius camber. Cantilever and multiple-span members shall not be cambered unless specifically indicated. Cambers shall be a smooth curve from support to support or from support to end of cantilever, as identified on the drawings.
- D. End-Cut Sealing: Immediately after end-cutting each member to final length, and after wood treatment (if any), apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces "flood-coated" for not less than 10 minutes.
- E. Seal Coat: After fabrication and sanding of each unit, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit, except for treated wood where treatment has included a water repellent.

2.03 FACTORY APPLIED PROTECTION

- A. Before shipping or exposing to outdoor conditions, individually wrap each member with manufacturer's standard, opaque, durable, water-resistant, plastic-coated paper covering, with water-resistant seams.

PART 3: EXECUTION

3.01 INSTALLATION

- A. Submit fabrication certificates to the building officials prior to installing glued laminated structural units.
- B. Contractor shall verify all cambers prior to installation. Measurement shall be verified with member lying on its side to avoid "self-weight" deflection. Installation of members shall

indicate contractor's acceptance of camber's and materials as specified.

- C. General: Install miscellaneous steel connectors, anchors, and accessories.
- D. Plan and execute erection procedures so that close fit and neat appearance of joints and structure as a whole will not be impaired. When hoisting members into place, use padded or non-marring slings, and protect corners with wood blocking.
- E. Adequately brace members as they are placed to maintain safe position until full stability is provided.
- F. Cutting: Avoid cutting glulam members during erection, to greatest extent possible. Except for fastener drilling and other minor cutting, coat cuts with end sealer as specified for "Fabrication".
 - 1. Where treated members must be cut during erection, apply a heavy brush coat of the same preservative treatment, complying with AWWPA Standard M4.
- G. Handle and temporarily support members to prevent visible surface damage.
- H. Do not remove wrapping on individually wrapped members until it will serve no useful purpose, including protection from weather, soiling and damage from work of other trades.
 - 1. Coordinate removal of wrapping with finishing work specified in Division 9. Retain wrapping wherever it can serve as a painting shield.
- I. Repair damaged surfaces and finishes after completion of erection and removal of wrappings, or replace damaged members as directed where damage is beyond acceptable repair.

3.02 PROTECTION

- A. Advise Contractor of necessary limitations on heating, ventilating and air conditioning in building, in order to avoid damage or deterioration of glulam work.

END OF SECTION 06 18 00

SECTION 06 19 60

PRE-FABRICATED WOOD "I" JOISTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Pre-fabricated wood "I" joists.

1.03 REFERENCES

- A. Comply with the applicable provisions of the following codes and standards as follows:
 - 1. International Code Council (ICC): California Building Code, 2016 edition.
 - 2. American society for testing and Materials (ASTM): D 5055-90 Establishing and Monitoring Structural Capacities of Prefabricated Wood "I" Joists.
 - 3. I-Joist product design information.
 - 4. Current ICC ESR report for I-joist product to be supplied.

1.04 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within 35 calendar days after the Contractor has received the owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Shop Drawings showing pertinent details of the units and their interface with other components of the structure.
 - 3. Manufacturer's recommended installation procedures.
 - 4. Plan layout of members, design loads and installation instructions, including required bridgings.
 - 5. Structural calculations signed by a California registered Civil Engineer.
 - a) Calculations shall illustrate structural design of each type of joist. Refer to drawings for design loads.
 - b) Calculations: Originals shall be prepared by and signed by a Civil or Structural Engineer registered by the State of California.
 - c) Submit one "wet signed" set and three copies.

- d) Joists shall be designed for support of all applicable load combinations specified by the CBC Code, including design specification for bottom flange bracings for uplift conditions.

1.05 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. These products shall be designed and manufactured to the standards set forth in the appropriate ICC ESR report for the product supplied, and shall conform to all DSA IR specifications.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Section 01620.
- B. Deliver materials of this Section to the job site in bundles banded together for handling and shipping.

1.07 WARRANTY

- A. The products supplied shall be free from any manufacturing errors or defects in workmanship and material. The design of members shall be adequate to carry the loads specified by the purchaser for the normal and expected life of the specified project.
- B. Joist manufacturer shall be responsible for the engineering design, fabrication, and in-place performance of I-Joists and related components.

PART 2 - PRODUCTS

2.01 PREFABRICATED WOOD CHORD JOISTS

- A. Design is based on ICC approved products of the manufacturer's listed. Equal products of other manufacturers will be acceptable with appropriate "Request For Substitution" and when approved by the Architect. Substitutions shall comply with all requirements of the drawings and specifications. Products for substitution shall be of a type and size accommodating the detail requirements of the project, as indicated in the drawings.
- B. GENERAL:
 - 1. Size and detail the work of this Section to fit the dimensions and loads indicated on the Drawings.
 - 2. Design in accordance with allowable values and section properties assigned and approved by the governmental agencies having jurisdiction.

3. Deflection limits shall apply when specified on the structural drawings.
- C. Provide "I-joist" units, factory made with structural grade plywood or OSB webs, "LVL" flanges, and utilizing waterproof type glues. No material substitutions will be accepted.
1. Flanges: Laminated Veneer Lumber (LVL) of sizes indicated on structural drawings, manufactured according to the manufacturing standards specified in ICC Report. Moisture contents shall be between 7 and 16 percent. Flanges to be one continuous piece with no splices.
 2. Webs:
 - a) Web material may be CD Structural 1 plywood with exterior glue, grade marked by APA, in accordance with Product Standard PSI-83, or Oriented Strand Board (OSB).
 - b) Webs shall be fully glued at splices.
 - c) Tapered I-Joists shall have plywood webs.
 - d) Thickness of webs shall be minimum sizes as specified on the referenced manufacturers' ICC report for the model of joist indicated.
 3. Adhesives shall be of the types specified in the TrusJoist manufacturing standards and which comply with ASTM D2559-79.
 4. Web Stiffeners and Blocking Panels: Comply with details and dimensions as shown on the drawings and in shop drawings. All stiffeners and blockings shall be delivered the jobsite in one assembled piece ready for installation directly to the joists.
 5. Metal Bridging shall be 18 gauge "TB-tension bridging" (nail type) as manufactured by Simpson Strong-Tie Company, Inc. or USP Connectors.

2.02 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.03 ALTERNATES OR EQUALS

- A. Manufacturers: As specified herein with properties and materials as specified on the structural drawings. Manufacturer's products shall have current ICC approval. Other manufacturers not listed will be considered by proper submittal through the Request For Substitution process.

1. Red Built (ICC ESR-2994)
2. Boise Cascade (ICC ESR-1336)
3. Roseburg (ICC ESR-1251)

- B. Due to the customized detailing and engineering characteristics of the specified framing assemblies, I-joist metal hangers and accessories have been specified according to the joist sizing and geometry of the listed manufacturer's products as indicated on the structural drawings. 'Alternative products' of sizes not compatible with the hangers and accessories specified will require alternate hangers and accessories to be submitted to the Architect for review and approval.

- C. Alternative products will be considered for approval as an alternative provided the proper

substitution procedures have been followed, and the following items meet or exceed that specified:

1. Allowable bending moment.
 2. Allowable shear strength.
 3. Moment of inertia.
 4. Modulus of elasticity.
 5. Manufacturing tolerances.
 6. ICC approval.
 7. Compatible flange and web materials.
 8. Compatible stiffeners and blockings in one piece, ready for installation.
- D. Alternative products, in order to be considered, shall have all details, plans, engineering calculations and other affected items submitted and coordinated in a timely fashion, including notice for the added inspection requirements (if necessary) so as to not delay the project.
1. Use of an alternate product may require additional DSA plan check fees and an Architect/Engineer of Record shop drawing review and revised design fee to accommodate the substitution, to be paid for by the Contractor.
- E. Substituted product dimensions, materials, fabrications and alternative details shall be compatible with the other related components of the total structural system and shall have all appropriate acceptances and approvals.

2.04 FABRICATION

- A. All Joists produced shall be manufactured under the supervision of a third party inspection agency in accordance with CBC Section 1704.2.5 unless fabricator is an "Approved Fabricator" in accordance with CBC, section 1704.2.5.2. Continuous inspections during fabrication, if required, will be provided and paid for by the Owner, but deducted from the payments to the Contractor.
- B. Each joist produced shall be identified by a stamp indicating the joist type, ESR report number, manufacturer's name, plant identification and the PFS Corporation logo.
- C. Web splices shall be fully glued and shall transfer vertical shear forces through the splice.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install the work of this Section in strict accordance with the Shop Drawings and manufacturer's recommendations as approved by the Architect.

B. Procedures:

1. Erect and install in accordance with the approved shop drawings.
2. Do not impose temporary construction loads, which cause stresses beyond design limits.
3. Erect bracing and bridging as required to maintain the units straight and plumb and as required for net uplift load conditions.
4. Assure adequate lateral support for installation means & methods until the sheathing material has been applied.
5. Contractor is responsible for the execution of all erection procedures to assure proper and safe installation of joists.

C. Hammering on the inside of flanges (away from the web) is not permitted.

D. Nails or screws into the sides of the flange, for purpose of supporting pipe, ceiling, or other loads, will be permitted only as detailed on the approved shop drawings.

E. Hanging of pipe, ceiling, or other loads from the top or bottom flange shall only be by the method specifically detailed by the manufacturer, as accepted by ICC.

F. Fire sprinkler main lines larger than 2 1/2" diameter shall not be supported from "I" Joists. Tributary lines 2 1/2" or smaller shall be supported midway between "I" Joists with bridging support methods only, at maximum 12 foot spacings. Fire sprinkler line supports shall be staggered from adjacent hangers to distribute loads uniformly to the "I" Joists.

G. Cutting or Notching of the flanges is prohibited.

H. Holes cut into the web are not permitted unless such holes are specifically detailed and dimensioned on the shop drawings or otherwise approved and in conformance with the ICC limitations.

I. Provide minimum mid-span bridging for I-JOIST spans exceeding 16'-0". Space bridgings per manufacturer's recommendations but not to exceed 16'-0" o.c.

J. Provide bridgings and bracings as indicated on the manufacturer's shop drawings.

3.03 FIELD QUALITY CONTROL

A. Tests and Inspections (See notes at paragraph entitled "Fabrication" for in-plant inspection requirements -if any)

1. The Contractor shall give notification to the Architect and to the Inspector of Record prior to enclosing the framing systems to provide for inspection of the installation.

B. The I-joist supplier or manufacturer shall have an experienced representative visit the site prior to covering the I-joists to verify that all joists, hangers and related components have been installed in general conformance to the manufacturer's requirements and specified

project applications.

END OF SECTION

SECTION 06 20 13
EXTERIOR FINISH CARPENTRY

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. Exterior Wood Cladding.
- 2. Exterior wood trim.

- B. Related Requirements:

- 1. Division 06 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
- 2. Division 09 Section "Painting" for paint finishes and installation procedures.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.

- B. ACTION SUBMITTALS

- 1. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
- 2. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- 3. Samples for Verification:
 - a. For each species and cut of lumber products with 1/2 of exposed surface finished.

- C. INFORMATIONAL SUBMITTALS

- 1. Evaluation Reports: For the following, from ICC-ES:

- a. Wood-preservative-treated wood.

D. Sample Warranties: For manufacturer's warranties.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.5 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
 - 1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: ANSI A135.4.

2.2 EXTERIOR WALL CLADDING

- A. Type 1: ReSawn Timber Company

1. Species and Grade: Western Red Cedar; Whistler, STK.
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.
4. Face Surface: Surfaced smooth.
5. Factory Priming: none

B. Type 2: ReSawn Timber Company

1. Species and Grade: Western Red Cedar; Briggs, Charred.
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.
4. Face Surface: Surfaced smooth.
5. Factory Priming: none

2.3 EXTERIOR TRIM

A. Lumber Trim: Match adjacent wood cladding

1. Species and Grade: Match adjacent cladding; prepare for paint finish.
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.
4. Face Surface: Surfaced smooth.
5. Factory Priming: none

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide hot-dipped galvanized nails or screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

1. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.

B. Flashing: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

2.5 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches (125 mm), except members with ends exposed in finished work.

B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed.
 - 1. Cut to required lengths and prime ends.
 - 2. Comply with requirements in Division 09 "Painting."

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.
 - 1. Use concealed shims where necessary for alignment.
 - 2. Scribe and cut exterior finish carpentry to fit adjoining work.
 - 3. Refinish and seal cuts as recommended by manufacturer.
 - 4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
 - 5. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long except where necessary.
 - 1. Use scarf joints for end-to-end joints.
 - 2. Stagger end joints in adjacent and related members.
- B. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- C. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean exterior finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 06 20 23
INTERIOR ARCHITECTURAL WOODWORK

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. Interior standing and running trim.
 - 2. Interior stairs and railings.
- B. Related Sections include but are not limited to the following:
 - 1. Division 05 – "Metal Fabrications" Section for metal stairs.
 - 2. Division 06 - "Plastic Laminate Casework" Section for casework and counter tops.
 - 3. Division 09 - "Painting" Section for field finishing of woodwork.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Wood-Preservative Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material and manufacturer's written warranty.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, trim profiles, 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 fixtures and other items installed in architectural woodwork.

3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

D. Samples for Verification:

1. For each species and cut of lumber and panel products with field-applied finish, with 1/2 of exposed surface finished:
 - a. Standing and Running Trim: 18 inch long sample.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be familiar with WI installation procedures and requirements and has experience installing products similar to those required for this Project and have a record of successful in-service performance.
- B. Quality Standard: Unless otherwise indicated, comply with the Woodwork Institute (WI) "Manual of Millwork" latest edition for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

- C. 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.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: AHA A135.4.

2.2 STANDING AND RUNNING TRIM

- A. General: Comply with WI Section 9, "Interior Trim, Jambs, and Millwork."
 - 1. Grade: Custom.
- B. Solid Hardwood Lumber Trim for Stain Finish, color to be confirm with Architect's sample:
 - 1. Species: Maple
 - 2. Maximum Moisture Content: 12 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Gluing for Width: Allowed for lumber trim wider than 6 inches.
 - 5. Veneered Material: Not allowed.
 - 6. Face Surface: Surfaced (smooth).
 - 7. Matching: Selected for compatible grain and color.

2.3 MISCELLANEOUS MATERIALS

- A. Concealed Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

- B. Exposed Fasteners for Interior Finish Carpentry: Flat head nickel finish screws at 8" o.c. into framing members. Provide mock up prior to installation for architect's review and approval.
- C. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
 - 1. Use wood glue that has a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. 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).
- D. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
 - 1. Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 FABRICATION

- A. Back out or kerf backs of standing and running trim except those with ends exposed in finished work:
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 72 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
 - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. General: Installation shall comply with WI Section 9, "Interior Trim, Jambs, and Millwork."
 - 1. Grade: Custom.
- B. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 2. Install trim after gypsum board joint finishing operations are completed.
 - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Upon completion of installation, all portions of exposed work shall have handling marks or effects of exposure to moisture removed with a thorough fine sanding using at least 150 grit sandpaper or finer, and shall be cleaned before sealing or finish operations.

3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during remainder of the construction period.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 06 41 13

WOOD-VENEER-FACED ARCHITECTURAL 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. Architectural wood cabinets.
2. Cabinet hardware and accessories.
3. Wood furring, blocking, shims, and hanging strips for installing architectural cabinets that are not concealed within other construction.
4. Shop finishing.

B. Related Requirements:

1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Division 06 Section "Interior Architectural Woodwork" for interior standing and running wood trim and paneling exposed to view that is not specified in this Section.
3. Division 06 Section "Solid Surface Counter Tops" for solid surface material counter tops.

1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For architectural cabinets.

1. Include plans, elevations, sections, and attachment details.
 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 3. Show locations and sizes of cutouts and holes for items installed in architectural cabinets.
 4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
 5. Apply WI Certified Compliance Program label to Shop Drawings.
- C. Samples: For each exposed product and for each color and finish specified, in manufacturer's standard size.
- D. Samples for Initial Selection: For each type of exposed finish.
- E. Samples for Verification: For the following:
1. Lumber for Transparent Finish: Not less than 5 inches (125 mm) wide by 12 inches (300 mm) long, for each species and cut, finished on one side and one edge.
 2. Veneer Leaves: Representative of and selected from flitches to be used for transparent-finished cabinets.
 3. Corner Pieces:
 - a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
 - b. Miter joints for standing trim.
 4. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish of the following:
 - a. Pulls.
 - b. Hinges.
 - c. Catches.
 - d. Locks.
 - e. Shelf supports.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: WI Certified Compliance Program certificates.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: 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. Manufacturer's Certification: Licensed participant in WI's Certified Compliance Program.
- B. Installer Qualifications: Installer shall be a licensed participant in WI's Certified Compliance Program and has experience installing products similar to those required for this Project and have a record of successful in-service performance.
- C. Quality Standard: Unless otherwise indicated, comply with the Woodwork Institute (WI) "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide WI-certified compliance labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.
- D. Regulatory Requirements, Seismic Design: Comply with requirements of the California Building Code, Part 2, Volume 2, Chapter 16A (State Chapter) "Structural Design Requirements," Section 1613A.1, ASCE Section 7-05, Table 13.5-1, and WI construction methods for seismic design for schools and hospitals.
- E. Regulatory Requirements, Accessibility: Casework shall comply with accessibility requirements of the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and with the California Building Code, Chapter 11B, "Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Publicly Funded Housing." Accessible casework shall comply with the following:
 - 1. Counter Top Heights: Not more than 34 inches above the floor surface.
 - 2. Knee Space: Vertical clearance of not less than 27 inches above the floor with a minimum width of 30 inches.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

- B. Field Measurements: Where cabinets are 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 cabinets by field measurements before being enclosed/concealed by construction, 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.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET MANUFACTURERS

- A. Source Limitations: Engage a qualified woodworking firm to assume responsibility for production of architectural cabinets with sequence-matched wood veneers, wood paneling, wood doors with face veneers that are sequence matched with architectural cabinets, and transparent-finished wood doors that are required to be of same species as architectural cabinets.

2.2 CABINETS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of architectural cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from WI certification program indicating that woodwork and installation complies with requirements of grades specified.
 - 2. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

2.3 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Custom.
- B. Fabricate cabinets as multiple self-supporting units rigidly joined together.
- C. Type of Construction: Type A, Frameless.
- D. Door and Drawer-Front Style: Style 1, Flush overlay.
- E. Wood for Exposed Surfaces:

1. Species: Maple.
2. Cut: Plain sliced/plain sawn.
3. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
4. Matching of Veneer Leaves: Book match.
5. Veneer Matching within Panel Face: Center-balance match.
6. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.

F. Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
 - a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
2. Drawer Subfronts, Backs, and Sides: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

G. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

2.4 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.
2. Wood Moisture Content: 8 to 13 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. MDF: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
2. Particleboard (Medium Density): ANSI A208.1, Grade M-2-Exterior Glue.
3. Softwood Plywood: DOC PS 1, medium-density overlay.
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

5. Thermoset Decorative Panels: Particleboard or MDF 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.

2.5 CABINET HARDWARE AND ACCESSORIES

- A. Frameless Concealed Hinges: ANSI/BHMA A156.9, B01602, 120 degrees of opening, self-closing.
 1. Blum, CLIP top 120° with screw on mounting and for full overlay.
- B. Pulls: Stainless steel square drawer pulls, 6-27/32 inches long, 9/16 inch square profile, 1-21/32 inch projection.
 1. Doug Mockett and Company, Inc.; DP105A/6.
- C. Catches:
 1. Magnetic catches, Knapp & Vogt, KV-916.
 2. Friction Catch: Bainbridge, FlexaCatch 2120.
 3. Slide Bolt: Quality Hardware.
- D. Drawer Suspension:
 1. Blum, Standard 230M 3/4 extension with Blumotion, 75 lb. dynamic, 100 lb. static.
 2. Grass, 6610, 100 lb.
 3. Accuride, 4033, 100 lb.
- E. Shelf Standards:
 1. LD 32 mm line boring system with 5 mm steel pins for shelving less than 36 inches wide.
 2. KV255 with KV256 supports for shelving 36 inches wide and wider.
 3. Provide seismic restraint pins in back row or notch shelf.
- F. Cabinet Door Locks: National C-8173-915KA-26, pin tumbler.
- G. Cabinet Drawer Locks: National C-8178-915KA-26, pin tumbler.
- H. Grommets for Cable Passage through Countertops: Molded-plastic grommet with minimum 1-1/2-inch diameter cord opening with matching slotted cap, black.
 1. Product: Subject to compliance with requirements, provide "SG series" by Doug Mockett & Company, Inc.
- I. Paper Slots: 12 inches long by 1-3/4 inches wide by 1 inch deep; black, molded-plastic, paper-slot liner with 1/4-inch lip.
 1. Product: Subject to compliance with requirements, provide "Model CP-2" by Doug Mockett & Company, Inc.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated. Finish of cabinet hardware shall

match exposed door hardware of the room in which casework is located; door hardware is specified in Division 8 Section "Door Hardware."

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
2. Satin Stainless Steel: BHMA 630.

- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in 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, General: Do not use adhesives that contain urea formaldehyde.

2.7 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated. Ease edges and corners to 1/16-inch (1.5-mm) radius unless otherwise indicated.
- B. Interior Woodwork Grade: Comply with Architectural Woodwork Standards quality standards indicated.
- C. Seismic Design: Fabrication shall comply with referenced seismic design requirements.
- D. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- E. 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.
- F. 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.

2.8 SHOP FINISHING

- A. General: Finish architectural cabinets at manufacturer's shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural cabinets, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- C. Transparent Finish:
 - 1. Architectural Woodwork Standards Grade: Custom.
 - 2. Finish: System - 5, conversion varnish.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 - 4. Staining: Match Architect's sample.
 - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

- A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with cabinet surface.
 - 1. For shop-finished items, use filler matching finish of items being installed.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.
 - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

2. Install cabinets without distortion so doors and drawers fit openings 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.
 3. Maintain veneer sequence matching of cabinets with transparent finish.
- E. Shop Finishes: Touch up finishing after installation of architectural cabinets. Fill nail holes with matching filler.
1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

3.3 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through WI's Certified Compliance Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
1. Inspection entity shall prepare and submit report of inspection.

3.4 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces. Touch up finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 41 16
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. This Section includes the following:
 - 1. Plastic-laminate cabinets.
 - 2. Closet and utility shelving.
- B. Related Sections include the following:
 - 1. Division 06 Section "Interior Architectural Woodwork" for interior standing and running wood trim and paneling exposed to view that is not specified in this Section.
 - 2. Division 06 Section "Solid Surface Counter Tops" for solid surface material counter tops.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated, including cabinet hardware and accessories.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 2. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural woodwork.
 - 3. Apply WI-certified compliance label to first page of Shop Drawings.
- D. Samples for Initial Selection:
 - 1. Plastic laminates.
 - 2. PVC edge material.
 - 3. 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.

4. 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 and whose products have a record of successful in-service performance.

B. Installer Qualifications: Installer shall be familiar with WI installation procedures and requirements and has experience installing products similar to those required for this Project and have a record of successful in-service performance.

C. Quality Standard: Unless otherwise indicated, comply with the Woodwork Institute (WI) "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

- 1. Provide WI-certified compliance labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.

D. Regulatory Requirements, Seismic Design: Comply with requirements of the California Building Code, Part 2, Volume 2, Chapter 16A (State Chapter) "Structural Design Requirements," Section 1613A.1, ASCE Section 7-05, Table 13.5-1, and WI construction methods for seismic design for schools and hospitals.

E. Regulatory Requirements, Accessibility: Casework shall comply with accessibility requirements of the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and with the California Building Code, Chapter 11B, "Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Publicly Funded Housing." Accessible casework shall comply with the following:

- 1. Counter Top Heights: Not more than 34 inches above the floor surface.
- 2. Knee Space: Vertical clearance of not less than 27 inches above the floor with a minimum width of 30 inches.

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 "Project Conditions" Article.

1.6 PROJECT 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 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 Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - 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 complying with LMA°SAT-1.

1. Provide PVC or polyester edge banding complying with LMA°EDG-1 on components with exposed or semi-exposed edges.
- 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.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. Face-Frame Concealed Hinges: ANSI/BHMA A156.9, B01602, 120 degrees of opening, self-closing.
 1. Blum, CLIP top 120° with screw on mounting and for frame inset.
- B. Inset Face-Frame Adapter: ANSI/BHMA A156.9, 175H5030.21, for face-frame application.
 1. Blum, CLIP top Face Frame Inset Adapter Plates with screw on mounting for frame inset.
- C. Pulls: Zinc industrial-style drawer pulls, 5-3/4 inches long, 11/16-inch-wide profile, 1-3/8 inch projection.
 1. Hickory Hardware; HH076012-VB
- D. Catches:
 1. Magnetic catches, Knapp & Vogt, KV-916.
 2. Friction Catch: Bainbridge, FlexaCatch 2120.
 3. Slide Bolt: Quality Hardware.
- E. Drawer Suspension: For inset installation.
 1. Blum, Tandem 563H 3/4 extension with Blumotion, 75 lb. dynamic, 100 lb. static and Rear Mounting Bracket 295.3750.01.
 2. Grass, Elite Plus 6610, 75 lb. dynamic, 100 lb. static with Rear Mounting Bracket.
 3. Accuride, 3832EC, 100 lb. with Rear Bracket Kit 4180-0745-XE.
- F. Shelf Standards:
 1. LD 32 mm line boring system with 5 mm steel pins for shelving less than 36 inches wide.
 2. KV255 with KV256 supports for shelving 36 inches wide and wider.
 3. Provide seismic restraint pins in back row or notch shelf.

- G. Cabinet Door Locks: National C-8173-915KA-26, pin tumbler.
- H. Cabinet Drawer Locks: National C-8178-915KA-26, pin tumbler.
- I. Grommets for Cable Passage through Countertops: Molded-plastic grommet with minimum 1-1/2-inch diameter cord opening with matching slotted cap, black.
 - 1. Product: Subject to compliance with requirements, provide "SG series" by Doug Mockett & Company, Inc.
- J. Paper Slots: 12 inches long by 1-3/4 inches wide by 1 inch deep; black, molded-plastic, paper-slot liner with 1/4-inch lip.
 - 1. Product: Subject to compliance with requirements, provide "Model CP-2" by Doug Mockett & Company, Inc.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated. Finish of cabinet hardware shall match exposed door hardware of the room in which casework is located; door hardware is specified in Division 8 Section "Door Hardware."
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - 2. Satin Stainless Steel: BHMA 630.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 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 nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- D. Adhesive for Bonding Plastic Laminate: As recommended by fabricator or manufacture. Use clear types where glue lines will be exposed.

2.4 FABRICATION, GENERAL

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Interior Woodwork Grade: Comply with Architectural Woodwork Standards quality standards indicated.

- C. Seismic Design: Fabrication shall comply with referenced seismic design requirements.
- D. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- E. 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.
- F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.5 PLASTIC-LAMINATE CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
- B. Grade: Custom Grade except where Premium Grade requirements indicated, comply with requirements of Architectural Woodwork Standards Section 10 "Casework."
- C. Fabricate casework as multiple self-supporting units rigidly joined together.
- D. Construction Type: Type B, Face-Frame.
- E. Interface Style: Style 2, flush inset.
- F. Laminate Cladding for Exposed Surfaces: 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.
- G. 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 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.
- 3. Drawer Bottoms: Thermoset decorative panels.
- H. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- I. Security Dust Panels: Provide 3/4-inch thick security dust panels above lockable drawers, unless located directly under tops.
- J. Shelves: Adjustable and as follows:
 - 1. Design loading: 50 psf.
 - 2. Maximum width: 4 feet.
 - 3. Thickness: 3/4 inch minimum, shelves 30 inches or more in width shall be 1-inch minimum thickness.
- K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - a. Boxes/ Drawer Faces: Formica 1547-PG Noir Cedar, Pure Grain Finish
 - b. Door: Formica 9484-NG Oxidized Beamwood

2.6 CLOSET AND UTILITY SHELVING

- A. Grade: Custom.
- B. Shelf Material: 3/4-inch thermoset decorative panel with 3 mm PVC edge banding.
- C. Cleats: 3/4-inch solid lumber.

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 backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 14 truss-head sheet metal screws through metal backing or metal framing behind wall finish.
- G. Countertops: 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-sag, bow, or other variation from a straight line.
 - 2. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

3.3 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 06 41 18
SOLID SURFACE COUNTER TOPS

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. Solid surface counter tops.
- B. Related Sections include but are not limited to the following:
 - 1. Division 05 Section "Metal Fabrications" for fabricated metal support brackets.
 - 2. Division 06 Section "Rough Carpentry" for blocking and shims required for installing counter tops and concealed within other construction before woodwork installation.
 - 3. Division 06 Section "Plastic Laminate Casework" for plastic laminate counter tops.
 - 4. Division 22 Sections as applicable to plumbing fixtures and trim.

1.3 SUBMITTALS

- A. See Division 01 Section "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For solid-surfacing material.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of blocking including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for plumbing fixtures and other items.
 - 4. Apply Woodwork Institute certified compliance label to first page of Shop Drawings.
- D. Samples for Initial Selection: Manufacturer's color charts or samples.
- E. Samples for Verification: Solid-surfacing materials, 6 inches square.

- F. Woodwork Quality Standard Compliance Certificates: WI-certified compliance certificates.
- G. Qualification Data: For Installer and fabricator.

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
- B. Installer Qualifications: Fabricator of products. Installer shall be familiar with WI installation procedures and requirements and has experience installing products similar to those required for this Project and have a record of successful in-service performance.
- C. Quality Standard: Unless otherwise indicated, comply with Woodwork Institute's "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
 - 1. Provide WI-certified compliance labels and certificates indicating that counter tops, including installation, complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver solid surface counter tops until painting and similar operations that could damage counter tops have been completed in installation areas. If counter tops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install solid surfacing materials until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 45 and 65 percent during the remainder of the construction period.
- B. Field Measurements: Where work 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 counter tops 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 counter tops 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, reinforcements, and other related units of Work specified in other Sections to ensure that interior solid surface counter tops can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 SOLID SURFACE MATERIAL COUNTER TOPS

- A. General: Comply with Woodwork Institute, Architectural Woodwork Standards, Section 11 "Counter Tops."
 1. Grade: Custom
- B. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 1. Basis of Design: Drawings and specifications are based on the following:
 - a. Wilsonart International; Div. of Premark International, Inc.
 - 1) Subject to compliance with requirements, provide the specified product or equivalent products by one of the following:
 - a) Avonite, Inc.
 - b) Formica Corporation.
 - c) E. I. du Pont de Nemours and Company; Corian.
- C. Solid-Surfacing-Material Thickness: 1/2 inch.
- D. Colors, Patterns, and Finishes: Basis of Design based on the products below. See Drawings for location.
 - a. Wilsonart 9225SS Saharan Night
 - b. Wilsonart 9110CS Paris Fog
 - c. Wilsonart 9207CS Flint Rock
 - d. Wilsonart 9220CE Tumbled Stone
- E. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

1. Front Edge: Built-up waterfall edge, 1 inch high, shop applied.
2. Splash: Shop-applied back splash complying with the following:
 - a. Height: 4 inches.
 - b. Style: Square, butt to countertop.
 - c. Top Edge: Square.
 - d. Side Splashes: Field applied square splash.

F. Drill holes in countertops for plumbing fittings and accessories in shop.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Wood Products: Comply with the following:

1. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
3. Softwood Plywood: DOC PS 1, Medium Density Overlay.

B. Silicone Sealant: Single-component, nonsag, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Color: Match counter top.

C. Grommets for Cable Passage through Countertops: 2-inch outside diameter, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Product: Subject to compliance with requirements, provide "SG series" by Doug Mockett & Company, Inc.

D. Paper Slots: 12 inches long by 1-3/4 inches wide by 1 inch deep; black, molded-plastic, paper-slot liner with 1/4-inch lip.

1. Product: Subject to compliance with requirements, provide "Model CP-2" by Doug Mockett & Company, Inc.

E. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

F. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Contact Adhesive: 250 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Casework and supports shall be plumb and level.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before installation, condition counter tops to required environmental conditions specified for installation areas.

3.3 INSTALLATION

- A. Install counter tops to comply with requirements for the same grade specified in Part 2 for fabrication of type of counter tops involved.
- B. Scribe and cut counter tops to fit adjoining work.
- C. Adhere counter tops to casework sub-tops as recommended in writing by solid surfacing manufacturer:
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 3. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

3.4 CLEANING AND REPAIR

- A. Repair damaged and defective work, where possible, to eliminate functional and visual defects; replace Work that cannot be repaired.
- B. Clean exposed and semiexposed surfaces.

END OF SECTION

SECTION 064216
FLUSH WOOD PANELING

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. Shop finishing.
 - 2. Flush wood paneling (wood-veneer wall surfacing).
- B. Related Requirements:

1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: For flush wood paneling.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show details full size.
 - 3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
 - 4. For paneling produced from premanufactured sets, show finished panel sizes, set numbers, sequence numbers within sets, and method of cutting panels to produce indicated sizes.

- 5. For paneling veneered in fabrication shop, show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
- 6. Apply WI Certified Compliance Program label to Shop Drawings.
- C. Samples: For each exposed product and for each color and finish specified, in manufacturer's or fabricator's standard size.
- D. Samples for Initial Selection: For each type of exposed finish.
- E. Samples for Verification: For the following:
 - 1. Veneer-Faced Panel Products for Transparent Finish: 8 by 10 inches (200 by 250 mm) for each species and cut. Include at least one face-veneer seam and finish as specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Product Certificates: For each type of product.
- C. Quality Standard Compliance Certificates: WI Certified Compliance Program.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.7 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. Shop Certification: WI's Certified Compliance Program licensee.
- B. Installer Qualifications: WI's Certified Compliance Program licensee.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups of typical paneling as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that might damage paneling have been completed in installation areas. Store paneling in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Environmental Limitations with Humidity Control: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.
- C. Field Measurements: Where paneling 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 paneling by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PANELING FABRICATORS

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of paneling and wood-veneer-faced architectural cabinets.

2.2 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of flush wood paneling (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.
 - 1. Provide inspections of fabrication and installation together with labels and certificates from WI certification program indicating that woodwork complies with requirements of grades specified.
 - 2. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

2.3 FLUSH WOOD PANELING (WOOD-VENEER WALL SURFACING)

- A. Grade: Custom.
- B. Wood Species and Cut: Maple, flat cut.
- C. Veneer Matching Method:
 - 1. Adjacent Veneer Leaves: Book match.
 - 2. Within Panel Face: Balance match.
 - 3. Adjacent Veneer Leaves and within Panel Face: Slip, center-balance, or book match.
- D. Panel-Matching Method:
 - 1. No matching is required between adjacent panels. Select and arrange panels for similarity of grain pattern and color between adjacent panels.
- E. Vertical Panel-Matching Method: Architectural end book match; veneer leaves are individually book matched from lower panels to upper panels.
- F. Panel Core Construction: Hardwood veneer-core plywood.
 - 1. Thickness: 1/2 inch for Ceiling Panels and 1/2 inch for Wall Panels. Refer to Drawings for additional information and requirements.
- G. Exposed Panel Edges: Inset solid-wood or wood-veneer matching faces.
- H. Panel Reveals: Refer to Drawings for additional information.
- I. Assemble panels by gluing and concealed fastening.

2.4 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- B. Wood Moisture Content: 4 to 9 percent.
- C. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 - 1. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.5 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber; Fire-retardant-treated softwood 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.
- C. Installation Adhesive: Product recommended by panel fabricator for each substrate for secure anchorage.

2.6 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Arrange paneling in shop or other suitable space in proposed sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.
 - 1. Lay out one elevation at a time if approved by Architect.
 - 2. Notify Architect seven days in advance of the date and time when layout will be available for viewing.
 - 3. Provide lighting of similar type and level as that of final installation for viewing layout unless otherwise approved by Architect.
 - 4. Rearrange paneling as directed by Architect until layout is approved.
 - 5. Do not trim end units and other nonmodular-size units to less than modular size until after Architect's approval of layout. Indicate trimming by masking edges of units with nonmarking material.
 - 6. Obtain Architect's approval of layout before start of assembly. Mark units and Shop Drawings with assembly sequence numbers based on approved layout.
- C. Complete fabrication, including assembly, 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.
 - 1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.
- D. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.7 SHOP FINISHING

- A. General: Finish paneling at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

- B. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished paneling specified to be field finished. See Section 099300 "Staining and Transparent Finishing" for material and application requirements.
- C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
 - 1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling.
- D. Transparent Finish:
 - 1. Grade: Custom.
 - 2. Finish: System – 2, precatalyzed lacquer].
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 4. Staining: Match Architect's approved sample for color.
 - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.
- B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Install with no more than 1/16 inch in 96-inch (1.6 mm in 2400-mm) vertical cup or bow and 1/8 inch in 96-inch (3 mm in 2400-mm) horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch (0.8 mm).
- C. Anchor paneling to supporting substrate as shown on the Drawings.
- D. Complete finishing work specified in this Section to extent not completed at shop or before installation of paneling. Fill nail holes with matching filler where exposed.

1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate defects. Where not possible to repair, replace paneling. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 64 00
FIBERGLASS REINFORCED 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:
 - 1. Glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.
- B. Related Sections:
 - 1. Division 09 Section "Gypsum Board" for finish wall where installing plastic paneling.

1.3 SUBMITTALS

- A. See Division 01 Section "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Samples for Initial Selection: For plastic paneling and trim accessories.
- D. Samples for Verification: For plastic paneling and trim accessories, in manufacturer's standard sizes.
 - 1. For each type of product specified, 3.5 inch x 5 inch square sample of plastic paneling in specified texture and color.
 - a. Cut sample and seam together for representation of manufacturer's seaming system.
 - b. Approved samples may be retained by manufacturer as a standard of work.
- E. Shop Drawings: Show location of each item, dimensioned plans, details, attachment locations, notch and cutout locations, and any other components required prior to commencement of work.
 - 1. Show locations and sizes of cutouts, electrical switch and outlet openings, holes and fixture information for wall panels.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver components until painting and similar finish operations that may damage the paneling have been completed in installation areas.
- B. Store materials at the temperature and environmental conditions that the areas will be during use of a minimum 48 hours prior to installation.
- C. Installer to handle materials to prevent damage to finished surfaces, and panel edges, and contamination of panel rear face.

1.6 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 GENERAL

- A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 FIBERGLASS REINFORCED PLASTIC SHEET PANELING

- A. General: 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. Crane Composites, Inc.
 - b. Marlite, Inc.
 - c. Nudo Products, Inc.
 - 2. Nominal Thickness: Not less than 0.09 inch.
 - 3. Surface Finish: Smooth.
 - 4. Color: As selected by Architect from manufacturer's full range of not less than six colors.
 - 5. Size: 4 foot wide by 8 foot high in one panel with no horizontal joints.

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.
7. Panels shall be USDA accepted for incidental food contact.

2.3 PLASTIC SHEET PANELING, WELDED SEAMS

- A. General: Vinyl, extruded, semi-rigid PVCu plastic panels with welded seams.
 1. Basis-of-Design: Drawings and Specifications are based on the following:
 - a. Marlite; Standard FRP S 490N
 - 1) Subject to compliance with requirements, provide product indicated or a comparable product subject to Request for Substitution.
 2. Nominal Thickness: Not less than 0.09 inch.
 3. Surface Finish: Smooth.
 4. Color: S 490N Light Gray
 5. Size: 4 foot wide by 10 foot high in one panel with no horizontal joints.
 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.
 7. Panels shall be USDA accepted for incidental food contact.
 8. Location: Plastic sheet paneling with welded seams shall be located only in the rooms indicated within the Finish Schedules
 9. Accessories:
 - a. Vinyl welding rod: by same manufacturer

2.4 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.

- 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. Color: Match panels.

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 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.
- 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 paneling is 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 07 21 00
THERMAL 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 the following:
 - 1. Glass fiber blanket insulation.
 - 2. Extruded polystyrene foam-plastic board insulation.
- B. Related Sections include the following:
 - 1. Division 05 Section "Structural Steel Framing" for roof deck framing.
 - 2. Division 07 Section "Underslab Vapor Retarder" for vapor retarder materials.
 - 3. Division 23 Sections as applicable to air distribution duct systems for insulation for ducts.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.5 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. 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.
- B. Unfaced Glass-Fiber Blanket Insulation: 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 and tested in accordance with ASTM E84.
- C. Reinforced-Foil-Faced Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, vapor-retarder membrane on 1 face.
- D. 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-21; 5-1/2 inch thickness.
 - 4. R-25; 8 inch thickness.
 - 5. R-30; 10 inch thickness.
 - 6. R-38; 12 inch thickness.

2.2 EXTRUDED POLYSTYRENE BOARD INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Owens-Corning.
 - 2. Kingspan Insulation LLC.
 - 3. DuPont.
 - 4. DiversiFoam Products.
- B. Extruded-Polystyrene Board Insulation: ASTM C578, Type IV, 1.45-lb/cu. ft. (23-kg/cu. m) minimum density, 25-psi (173-kPa) minimum compressive strength square edged.
 - 1. Thermal Resistance: R-value of 5.0 per inch (25.4 mm).
 - 2. Size: 48 by 96 inches (1219 by 2438 mm).
 - 3. Thickness:

- a. Base Layer: 1-1/2 inches (38 mm).
- 4. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
- 5. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
- C. Tapered Insulation: Provide factory-tapered insulation boards.
 - 1. Material: Match roof insulation.
 - 2. Minimum Thickness: 1/4 inch (6.35 mm).
 - 3. Slope:
 - a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.3 ACCESSORY MATERIALS

- A. Accessory materials shall be as recommended in writing by insulation manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for conditions affecting performance of the Work.
- B. Verify surfaces to receive spray insulation to determine if priming/sealing is required to ensure bonding and/or to prevent discoloration caused by migratory stains.
- C. 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.
- B. Prime surfaces to receive spray insulation as required by manufacturer's instructions or as determined by examination.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

- B. Install insulation to provide a complete thermal envelope having thermal resistance values indicated on drawings.
- 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.
- F. Extruded Polystyrene Board Insulation: On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches from exterior walls.
 - 2. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
 - 3. Installation Over Wood Decking:
 - a. Install base layer of insulation with end joints staggered not less than 12 inches (305 mm) in adjacent rows.
 - 1) Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2) Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
 - 3) At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
 - a) Trim insulation so that water flow is unrestricted.
 - 4) Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 5) Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
 - 6) Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood decks.
 - a) Fasten insulation according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
 - b) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

4. Installation of Tapered Insulation:

- a. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.
 - 1) Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.
 - 2) Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 3) Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
 - 4) At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).
 - a) Trim insulation so that water flow is unrestricted.
 - 5) Fill gaps exceeding 1/4 inch (6 mm) with insulation.
 - 6) Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
 - 7) Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
 - a) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - b) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

G. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

- 1. Install insulation of types indicated below:
 - a. Exterior Walls: R-19
 - b. Interior Walls:
 - 1) Walls between Conditioned and Unconditioned Spaces: R-19
 - 2) Walls Between Conditioned Spaces: acoustical insulation as noted on Plans
 - c. Gypsum Board Ceilings: R-30 Unfaced thermal insulation where required to provide a complete thermal envelope.
 - d. Underside of Roof Deck: R-36 Faced thermal insulation.

2. 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.
 3. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 4. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 5. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 6. 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.
 7. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 8. Unfaced Blankets: Install unfaced insulation in stud wall cavities of interior walls between interior spaces, thickness of insulation to match stud width.
- H. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces of walls and around door and window frames. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
- I. 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.
- J. 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 07 26 16
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 barrier for concrete slabs on grade.
- B. Related Sections include but are not limited to the following:
 - 1. Division 03 Section "Cast-in-Place Concrete."
 - 2. Division 31 Section "Earthwork."

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated, include manufacturer's specifications and installation instructions.
- C. Samples: For vapor barrier membrane.
- D. Digital Photography: Digital photographs of completed installation including seam and penetration sealing, terminations at foundations, and repairs.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain vapor barrier materials through one source from a single manufacturer.
- 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 barrier, reinforcing steel, and pouring of concrete slabs to minimize exposure of vapor barrier to sunlight.
- B. Coordinate installation of vapor barrier with reinforcing steel to minimize tears and punctures.

PART 2 - PRODUCTS

2.1 VAPOR BARRIERS

- A. Plastic Vapor Barrier: 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. Stego Industries Inc.; Stego Wrap 15.
 - b. Fortifiber Building System; Group 15 mil.
 - c. W.R. Meadows, Inc., Sealtight Perminator 15.
 - 2. Thickness: 15 mils.
 - 3. Roll Width: 12 feet minimum.
 - 4. Maximum Permeance: ASTM E96 new material 0.010 Perms; ASTM E154 Section 11 after weathering 0.010.
 - 5. Puncture Resistance: ASTM D1709, Method B, not less than 3,000 Grams.

2.2 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by manufacturer for intended use and compatible with vapor barrier.
- B. Seam Tape: High Density Polyethylene Tape with pressure sensitive adhesive as manufactured or recommended by vapor barrier manufacturer, minimum width 4 inches.
- C. Pipe Boots: Construct pipe boots from vapor barrier 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 barrier 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."
- B. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.3 INSTALLATION OF VAPOR BARRIER

- A. Vapor Barriers: Place, protect, and repair vapor barrier according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Vapor barrier to be installed over prepared, finely graded subgrade.
- B. Unroll vapor barrier 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 barrier. 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 barrier 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 barrier not less than 12 inches into footing trench prior to pouring footings.
- G. Place 2 inches of dry sand over properly installed and inspected vapor barrier. Protect from rain and moisture; remove sand that is saturated or dampened prior to concrete placement.
- H. Coordinate installation of vapor barrier 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 barrier membrane, repair all holes.
 - 3. Provide for protection of vapor barrier membrane in high traffic areas.

3.4 FIELD QUALITY CONTROL

- A. Immediately after the installation of the vapor barrier, 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 barrier 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 barrier 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 barriers 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 barrier prior to concrete placement by air blowers.

END OF SECTION

SECTION 07 27 00
AIR AND WEATHER BARRIERS

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. Building wrap.
 - 2. Flexible flashing.
 - 3. Drainage Material (Rainscreen)
- B. Related Sections include but are not limited to the following:
 - 1. Division 06 Section "Rough Carpentry."
 - 2. Division 07 Section "Sheet Metal Flashing and Trim."
 - 3. Division 08 Sections as applicable to doors, windows, and similar wall openings.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated, include data on air and moisture infiltration protection based on testing according to referenced standards.
- C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Weather resistive barrier membrane.
 - 2. Rainscreen Membrane
- D. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing weather resistive barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

- B. Source Limitations: Obtain each type of product through one source from a single manufacturer.
- C. Mockups: Before beginning installation, build mockup of weather resistive barrier assembly as directed by Architect, incorporate surface preparation, crack and joint treatment, sealing of gaps and terminations, and penetration flashing for window and door frames.
 - 1. Approved mockups may become part of the completed Work if undisturbed and undamaged.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in their original undamaged packages in a clean, dry, protected location and in accordance with manufacturer's written recommendations.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Install weather resistive barrier within the range of ambient and substrate temperatures recommended by weather resistive barrier manufacturer. Protect substrates from environmental conditions that affect performance of weather resistive barrier. Do not apply weather resistive barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.7 COORDINATION

- A. Coordinate the sequence of installation of weather resistive barrier membrane with the installation of exterior wall sheathing and wall finish materials in order to minimize the exposure of sheathing and weather resistive barrier membrane to moisture, wind, and sunlight.

PART 2 - PRODUCTS

2.1 WEATHER RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
 - 2. Performance Characteristics:

- a. Air Penetration: 0.001 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. ≤0.04 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2357.
- b. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
- c. Water Penetration Resistance: Minimum 280 cm when tested in accordance with AATCC Test Method 127.
- d. Basis Weight: Minimum 2.7 oz/yd², when tested in accordance with TAPPI Test Method T-410.
- e. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
- f. Tensile Strength: Minimum 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
- g. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.
- h. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 10, Smoke Developed: 10.
- i. Allowable UV Exposure Time: Not less than three months.

2.2 FLEXIBLE FLASHING

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DuPont (E. I. du Pont de Nemours and Company).
 - 1) Dupont Flex-Wrap (70 mil), use at window sills.
 - 2) Dupont Straight-Flash (30 mil), use at door and window heads and jambs.

2.3 DRAINAGE MATERIAL

- A. Drainage Material: Product shall maintain a continuous open space between water-resistive barrier and exterior cladding to create a drainage plane and shall be used under siding.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DuPont (E. I. du Pont de Nemours and Company).
 - 1) Dupont Tyvek DrainVent Rainscreen.
 - b. Approved equal

2.4 SEALING TAPE AND FASTENERS

- A. Sealing Tape: Pressure-sensitive plastic tape recommended by building wrap manufacturer for sealing joints and penetrations in building wrap.
- B. Screws for Fastening Membrane to Steel Framing: Manufacturer's standard corrosion resistant screws with 2-inch diameter plastic washers and of length required to penetrate not less than 1-inch into framing.

2.5 MISCELLANEOUS MATERIALS

- A. Primers: Primers as recommended in writing by weather resistive barrier membrane manufacturer.
- B. Sealants: Sealants as recommended in writing by weather resistive barrier membrane manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for weather resistive barrier application.
- B. Treat fins, ridges, other projections, and changes in substrate plane to provide a smooth transition and eliminate sharp projections or edges between surfaces.

3.3 INSTALLATION, GENERAL

- A. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- B. Coordinate installation of weather resistive barrier with installation of flexible flashing.
- C. Coordinate installation of weather resistive barrier with installation of rainscreen and subsequent application/installation of exterior wall finish materials.

3.4 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing at exterior door, window, and similar openings to comply with manufacturers written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.
- B. Begin installation of flexible flashing at sills of openings, lap jamb flashing over sill flashing, lap head flashing over jamb flashing.
 - 1. Fasten sill flashing at top edge only to allow for subsequent installation of weather resistive barrier membrane behind sill flashing.

3.5 WEATHER RESISTIVE BARRIER MEMBRANE INSTALLATION

- A. General: Install weather resistive barrier over exterior side of wall sheathing in accordance with manufacturer's written instructions and as follows.
 - 1. Begin installation of the weather resistive barrier at the bottom of the wall, run weather resistive barrier horizontally and set level. Install subsequent layers over previous layers lapping horizontal joints not less than 2 inches in shingle fashion for drainage.
 - 2. Overlap weather resistive barrier at corners of building by a minimum of 12 inches.
 - 3. Overlap weather resistive barrier at vertical seams by a minimum of 6 inches.
 - 4. Seal seams, edges, fasteners, tears, and penetrations with tape.
 - 5. Install weather resistive barrier behind flexible sill flashing lapped in shingle fashion to shed water.
 - 6. Extend over jambs of openings and seal corners with tape.
 - 7. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion or control-joint locations.
 - 8. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.
 - 9. Secure weather resistive barrier with screws with washers screwed through exterior sheathing and into metal stud framing. Space fasteners as recommended in writing by weather resistive barrier manufacturer.

3.6 DRAINAGE MATERIAL MEMBRANE INSTALLATION

- A. Install drainage material over building wrap and flashing to comply with manufacturer's written instructions.

3.7 PROTECTION

- A. Protect weather resistive barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions, until subsequent finishes are applied.
 - 1. Protect weather resistive barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace weather resistive barrier exposed to these conditions for more than 30 days.

END OF SECTION

SECTION 07 41 13
METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Prefinished, prefabricated structural standing seam roof system with continuous interlocking field formed seams.
- B. Related Requirements:
 - 1. Section 05 10 00: Structural Metal Framing.
 - 2. Section 05 40 00: Cold-Formed Metal Framing.
 - 3. Section 05 50 00: Metal Fabrications.
 - 4. Section 07 62 00: Sheet Metal Flashing and Trim
 - 5. Section 07 92 00: Joint Sealants.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASCE 7: Minimum Design Loads for Buildings and Other Structures.
 - 2. ASTM A653: Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
 - 3. ASTM A792: Steel Sheet, 55 % Aluminum Zinc Alloy Coated by the Hot Dip Process.
 - 4. ASTM C1371: Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 - 5. ASTM C1549: Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 - 6. ASTM D523: Specular Gloss.
 - 7. ASTM E1680: Rate of Air Leakage Through Exterior Metal Roof Panel Systems
 - 8. ASTM E1592: Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 - 9. ASTM E1646: Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 - 10. ASTM E1918: Measuring Solar Reflectance of Horizontal and Low Sloped Surfaces in the Field.
 - 11. ASTM E1980: Calculating Solar Reflectance Index of Horizontal and Low Sloped Opaque Surfaces.
 - 12. ASTM E2140: Weather Penetration of Metal Roof Panel Systems by Static Water Pressure Head.
 - 13. CRRC-1 Method #1: Measuring Solar Reflectance of a Flat, Opaque, and Heterogeneous Surface Using a Portable Solar Reflectometer.
 - 14. FM Approvals Standard 4471: Class 1 Panel Roofs.
 - 15. SMACNA Architectural Sheet Metal Manual.
 - 16. UL 580: Standard for Tests for Uplift Resistance of Roof Assemblies
 - 17. US Environmental Protection Agency: Energy Star Reflective Roof Products

1.3 SUBMITTALS

- A. Product Data.
- B. Shop Drawings:
 - 1. Indicate thickness and dimensions of parts, fastenings and anchoring methods, details and locations of joints, transitions and other provisions necessary for thermal expansion and contraction.
 - 2. Indicate locations of field- and factory-applied sealant.
- C. Samples:
 - 1. Submit two samples, 12 inches long by full panel width, showing proposed metal thickness and seam profile.
 - 2. Submit standard color samples of metal for Architect's selection.
- D. Manufacturer Qualifications.
- E. Installer Qualifications: Submit list of completed projects, with names and contact information for architects and contractors.
- F. Test Reports: Indicating compliance of products with project requirements.
- G. Warranty Documentation.
- H. Insurance Documentation.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Ten years' experience, minimum, in factory fabrication of metal panels.
 - 2. Manufacturer shall carry \$2,000,000 liability insurance, minimum, for metal panel system.
- B. Installer Qualifications:
 - 1. Three years' experience, minimum, in application of metal roof or wall panels.
 - 2. Five satisfactory projects with metal panel work of similar scope and complexity to Work of this Project.
 - 3. Installer must be approved by manufacturer in writing prior to bid. Approval document must be included with project bid.
- C. Testing Agency Qualifications: Agency compliant with ISO/IEC Standard 17025, or an accredited independent agency recognized by the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement or ANSI.
- D. Mock-Ups:
 - 1. Visual Mock-Up: Construct mock-up, 10 by 10 feet or larger as required to show at least two pattern repeats, and in same orientation as facade designated by Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
 - 1. Keep panels and accessory items dry.

2. Protect against damage and discoloration.
3. Handle panels with non-marring slings.
4. Support panels to prevent permanent deformation.
5. Store panels above ground, with one end elevated for drainage.
6. Protect panels against standing water and condensation between adjacent surfaces.
7. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.
8. Painted panels shall be shipped with protective plastic sheeting or a strippable film coating between panels. Remove strippable film coating prior to installation. Do not allow strippable film coating to remain on panels in extreme heat, cold, or direct sunlight or other UV source.
9. Do not allow panels to contact treated lumber.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard 25-year performance warranty, stating the following:
 1. Architectural fluorocarbon finish:
 - a. Will be free of fading or color change in excess of 5 Hunter delta-E units as determined by ASTM D2244-02.
 - b. Will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D4214-98 method D659.
 - c. Will not peel, crack, chip, or delaminate.
 2. Metal substrate will not rupture, fail structurally, or perforate.
- B. Installer's Warranty: Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, covering repairs required to maintain roof panels watertight and weatherproof with normal usage for two years following Project Substantial Completion date.
 1. Furnish written warranty, signed by installer.
- C. Weathertight Performance Warranty: Manufacturer's standard warranty in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weather tight within specified warranty period.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Products: Provide the following:
 1. AEP Span; SpanSeam.
 2. Approved Equal
- B. Substitution Limitations: Substitutions will be considered in accordance with Section 01 25 00 "Substitution Procedures".
- C. Performance Criteria
 1. Wind Uplift: Class 90 per UL 580

- a. Panel system shall be ASTM E1592 tested under the supervision of an ANSI accredited laboratory and the laboratory shall issue the test report.
- 2. FM Rating: Class 1-120 according to FM Approvals Standard 4471.
- 3. Air Infiltration: Tested in accordance with ASTM E1680.
 - a. 0.002 cfm per linear foot of joint at static test pressure differential of 12.00 psf.
- 4. Water Infiltration Under Static Pressure: Tested with sidelap sealant per ASTM E1646.
 - a. No leakage through panel joints at 15.00 psf.
- 5. Water Penetration: No leakage through panel side seams and endlaps after six hours when tested according to ASTM E2140 at a static water pressure head of 6.00 inches.
- 6. Thermal Movements: Accommodate thermal movement without buckling, joint opening, overstressing components, failure of connections, or other detrimental effects, through the following temperature changes:
 - a. 120 degrees F, ambient.
 - b. 180 degrees F, material surface.
- D. Sustainability Characteristics:
 - 1. Recycled Content: 28.9 percent post-consumer recycled content
 - 2. Energy Performance:
 - a. Provide Energy Star qualified product for slope indicated in Drawings.
 - b. Solar reflective index (SRI): Not less than 29 per ASTM E1980.
 - c. Reflectance and Emissivity:
 - 1) Solar Reflectance: Not less than 0.25 per ASTM test methods C1549 or E1918, or CRRC-1 Method #1.
 - 2) Thermal Emissivity: Not less than 0.75 per ASTM C1371.

2.2 PANELS

- A. Panels: AEP Span; Preformed Metal Standing Seam Roofing – SpanSeam
 - 1. Material: Steel conforming to ASTM A792.
 - a. 24 Gauge: Yield strength 50,000 psi; with aluminum-zinc alloy coating conforming to ASTM A792, Class AZ50.
 - 2. Panel Width and Pattern:
 - a. 16-inch panel width, flat pan
 - 3. Panel Seam Height: 2 inches.
 - 4. Panel Finish: Provide primer and top finish coat on exposed faces; provide primer and backer coat on concealed faces of panels.
 - a. Zincolume® Plus protective coating for unpainted aluminum-zinc alloy coating.
 - 5. Seam Sealant: Factory apply high-grade butyl mastic sealant within the confines of panel's female leg, designed to seal against adjacent male panel leg.

2.3 FRAMING AND SUBSTRATES

- A. Secondary Framing: See Section 05 40 00 "Cold-Formed Metal Framing".
- B. Sheathing: See Section 06 16 00 "Sheathing".

- C. Metal Roofing Underlayment:
 - 1. Self-Adhering Sheet Underlayment:
 - a. AEP Span Underlayment HT as required for full 20 year warranty
 - b. Approved Equal

2.4 CLIPS AND FASTENERS

- A. Clips: Provide clip designed to allow panels to thermally expand and contract. Clip shall incorporate a self-centering feature to allow 1 inch of movement in both directions along panel length. Clip type shall be selected to meet positive and negative pressures as specified.
 - 1. Sealant: Factory-installed sealant to provide continuity of seal at clip locations.
- A. Fasteners: As recommended by manufacturer for performance indicated.

2.5 INSULATION

- A. Rigid Insulation: See Division 07 "Thermal Insulation" for Extruded-Polystyrene Board Insulation.

2.6 INSULATION ACCESSORIES

- A. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.
 - 1. Basis-of-Design: Densdeck Roof Board, gypsum roof board with fiberglass mat facers, meeting C-1177.
 - 2. Thickness: 1/2 inch (13 mm).

2.7 ACCESSORIES

- A. Trims and Flashings: Material, metal thickness, and finish to match panels. Profiles indicated in Drawings.
 - 1. Provide manufacturer's standard accessories and other items essential to completeness of standing seam roof installation.
- B. Panel Penetration Flashings: As recommended by panel manufacturer; designed to provide sufficient movement to prevent creation of points of fixity at penetrations.
- C. Sealant for Field Application: high grade non-curing butyl or curing urethane sealant as recommended by panel manufacturer. Do not use sealant containing asphalt.

2.8 FABRICATION

- A. Fabrication, General:
 - 1. Unless otherwise shown on Drawings or specified herein, fabricate panels in continuous lengths and fabricate flashings and accessories in longest practical lengths.
 - 2. Panels shall be factory correctively-leveled.
- B. Panels:
 - 1. Provide panels in full length from ridge to eave when possible.

2. Where single length panels are not practical, provide mated swaged panels for positive joint end laps, shingled to accommodate water run-off (fabricated with overlap in direction of water flow).
 3. Roof panels shall have flush horizontal and vertical surfaces to facilitate sealing at terminations. Panel configurations which create voids and requiring supplemental closure devices shall not be considered acceptable.
 4. Engineer panels to use concealed anchors that permit expansion and contraction, except at eaves, end laps, ridges, valleys, hips and gables.
- C. Seams:
1. Panel seams shall interlock entire length of seam.
 2. Design standing seam to lock up and resist joint disengagement during design wind uplift conditions as calculated according to local building codes.
 3. Provide pre-installed sealant within confines of panel's female leg to aid in resistance of leaks and provide panel-to-panel seal while allowing expansion and contraction movement.
 4. Seams shall be continuously locked or crimped together by mechanical means during installation. Seaming tools shall be sourced from manufacturer's recommended vendor.
- D. Fabrication Tolerances:
1. Flat metal surfaces will display waviness commonly referred to as "oil canning". This is caused by steel mill tolerances and is a characteristic, not a defect, of panels manufactured from light gauge metal. Panels are factory correctively-leveled to minimize the occurrence of "oil canning". As such, "oil canning" will not be accepted as cause for rejection.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: With Installer present.
1. Examine conditions and substrates on which metal panels are to be installed. Structural support or substrate shall be flat and plumb to avoid panel stresses and distortion.
 2. Prior to starting work, correct defects.
- B. Field Measurements:
1. Coordinate field measurements and fabrication schedule with construction progress.
 2. Field measure prior to fabrication. Show recorded dimensions on shop drawings, including locations of shop-fabricated openings.
 3. If field measurements differ from drawing dimensions, notify Architect prior to fabrication.
- C. Substrate Tolerances: Deviations from flat plane shall not exceed the following.
1. 1/4 inch in 20 feet.

3.2 PREPARATION

- A. Substrate and Underlayment: Install according to approved shop drawings and metal panel manufacturer's recommendations.

3.3 INSTALLATION

- A. Panels and Trim: Comply with manufacturer's instructions for assembly, installation and erection for weather tight installation.
 - 1. Install according to approved shop drawings.
 - 2. Install panels in accordance with manufacturer's instructions and recommendations. Anchor securely in place using clips and fasteners spaced in accordance with manufacturer's recommendations for design wind load criteria.
 - 3. Form seams with manufacturer-approved motorized seaming tool; completely engage panel, clip, and factory-applied sealant in seam.
 - 4. Comply with methods and recommendations of SMACNA Architectural Sheet Metal Manual for flashing configurations required.
 - 5. Discrepancies between job site conditions and shop drawings shall be brought to the attention of the Architect for resolution.
 - 6. Cutting and Fitting:
 - a. Cut panels neat, square, and true with shearing action cutters. Torch or power saw cutting is prohibited.
 - b. Openings 6 inches and larger: Shop fabricate and reinforce to maintain original load capacity.
 - c. Openings less than 6 inches: Field cutting is acceptable.
 - 7. Dissimilar Metals or Materials:
 - a. Where panel or trim may come in contact with dissimilar metals or treated lumber, fabricate transition to facilitate drainage and minimize possibility of galvanic action. Galvanic action can cause panels and trim to fail prematurely.
 - b. At points of contact with dissimilar metal or treated lumber, coat panel and trim with protective paint or separate materials with a weatherproof underlayment.
 - c. Direct contact or run-off from CCA, ACQ, CA, or other treated lumber (outdoor wood) or fire retardant impregnated or treated wood shakes or siding can cause panels and trim to fail prematurely. Avoid contact with these materials.
- B. Accessories: Install trims, flashings, and roofing specialties according to Drawings and manufacturer's recommended details.
- C. Sealant Installation: Apply according to approved shop drawings and SMACNA Architectural Sheet Metal Manual recommendations.
 - 1. Provide airtight and waterproof installation.
- D. Installation Tolerances: Match dimensional tolerances of framing or substrate.

3.4 CLEANING

- A. Repairs:

1. Panels or flashings with finish damage exposing metal or with substrate damage shall be replaced.
- B. Cleaning and Waste Management: See Division 01 Section "Construction Waste Management and Disposal" for recycling requirements.
1. At completion of each day's work and at work completion, sweep panels, flashings, and gutters clean. Do not allow fasteners, cuttings, filings, or scraps to accumulate.
 2. Clean exposed surfaces of work promptly after completion of installation.
- 3.5 PROTECTION
- A. Protect Work as required to ensure that roofing will be without damage at Final Completion.

END OF SECTION

SECTION 07 54 19
POLYVINYL-CHLORIDE (PVC) ROOFING

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. Mechanically fastened, polyvinyl chloride (PVC) roofing system.
 2. Vapor retarder.
 3. Cover board.
 4. Walkways.
- B. Related Requirements:
1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
 2. Section 072100 "Thermal Insulation" for insulation beneath the roof deck, beneath roofing membrane, and tapered insulation.
 3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
 4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Review coordination methods necessary for installation of multiple roofing systems.

B. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Review coordination methods necessary for installation of multiple roofing systems.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of SPRI's Directory of Roof Assemblies listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation thickness and slopes.
5. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
6. Tie-in with air barrier.

C. Samples for Verification: For the following products:

1. Roof membrane and flashing, of color required.
2. Walkway pads or rolls, of color required.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, tests performed by independent qualified testing agency indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field Test Reports:

1. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is listed in SPRI's Directory of Roof Assemblies for roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, and other components of roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all

components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, vapor retarders, and walkway products, for the following warranty period:

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist the wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:
- D. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.
 - 1. Wind Uplift Load Capacity: 90 psf.
- E. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- F. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 MANUFACTURER

- A. Basis-of-Design Products: Where named manufacturer's products are indicated, Drawings and Specifications are based on the following:
 - 1. Sika Sarnafil; Sikaplan Mechanically Attached Roofing, 60 mil EnergySmart.

2. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:
 - a. GAF Roofing
 - b. Carlisle Syntec Systems

2.3 POLYVINYL CHLORIDE (PVC) ROOFING

- A. PVC Sheet: ASTM D4434/D4434M, Type III, fabric reinforced.
 1. Thickness: 60 mils (1.5 mm).
 2. Exposed Face Color: To be Selected.

2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Bonding Adhesive: Manufacturer's standard.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 VAPOR RETARDER

- A. Polyethylene Film: ASTM D4397, 10 mils (0.25 mm) thick, minimum, with maximum permeance rating of 0.13 perm (0.084 metric perm).
 1. Basis-of-Design: Sika Sarnafil Vapor Retarder PE 10.
 2. Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.
 - a. Basis-of-Design: Sika Sarnafil, Multi-Purpose Tape ST.
 3. Adhesive: Manufacturer's standard lap adhesive, listed by FM Approvals for vapor retarder application.

2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by PVC roof membrane manufacturer, approved for use in SPRI's Directory of Roof Assemblies listed roof assemblies.
- B. See Section 07 21 00 "Thermal Insulation" for Extruded-Polystyrene Board Insulation.
- C. Tapered Insulation: Provide factory-tapered insulation boards per Section 07 21 00 "Thermal Insulation" for Extruded-Polystyrene Board Insulation.

2.7 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.
 - 1. Basis-of-Design: Densdeck Roof Board, gypsum roof board with fiberglass mat facers, meeting C-1177.
 - 2. Thickness: 1/2 inch (13 mm).

2.8 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.
 - 1. Size: 36 inches wide minimum.(914 mm).
 - 2. Color: Contrasting with roof membrane.

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 the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Applicator shall verify that the work done under related sections meets the following conditions:
 - 1. Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
- C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- D. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
 - 1. Submit test result within 24 hours of performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, SPRI's Directory of Roof Assemblies listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 and 6 inches (50 and 150 mm), respectively.
 - 1. Extend vertically up parapet walls and projections to a minimum height equal to height of the insulation and cover board.
 - 2. Continuously seal side and end laps with tape.

- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.5 INSTALLATION OF INSULATION

- A. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- B. See Section 07 21 00 "Thermal Insulation" for installation of Extruded Polystyrene Foam Board and Tapered Insulation.
- C. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at end of workday.

3.6 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 - 3. Cut and fit cover board tight to nailers, projections, and penetrations.

3.7 INSTALLATION OF MECHANICALLY FASTENED ROOF MEMBRANE

- A. Mechanically fasten roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Mechanically fasten or adhere roof membrane securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- G. In-Seam Attachment: Secure one edge of PVC sheet using fastening plates or metal battens centered within seam, and mechanically fasten PVC sheet to roof deck.

- H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.8 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.9 INSTALLATION OF WALKWAYS

- A. Flexible Walkways: Install walkway products according to manufacturer's written instructions.
 - 1. Install flexible walkways at the following locations:
 - a. Perimeter of each rooftop unit.
 - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - d. Top and bottom of each roof access ladder.
 - e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
 - f. Locations indicated on Drawings.
 - g. As required by roof membrane manufacturer's warranty requirements.

2. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Perform the following tests:
 1. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - a. Perform tests before overlying construction is placed.
 - b. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 2 inches (50 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (50 mm) of clearance from top of base flashing.
 - c. Flood each area for 24 hours.
 - d. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.
 - 1) Cost of retesting is Contractor's responsibility.
 - e. Testing agency shall prepare survey report indicating locations of initial leaks, if any, and final survey report.
 2. Infrared Thermography: Testing agency shall survey entire roof area using infrared color thermography according to ASTM C1153.
 - a. Perform tests before overlying construction is placed.
 - b. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing or nuclear hydrogen detection tests.
 - c. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
 - 1) Cost of retesting is Contractor's responsibility.
 - d. Testing agency shall prepare survey report of initial scan indicating locations of entrapped moisture, if any.
 3. Electrical Capacitance/Impedance Testing: Testing agency shall survey entire roof area for entrapped water within roof assembly according to ASTM D7954/D7954M.
 - a. Perform tests before overlying construction is placed.

- b. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency shall prepare survey report indicating locations of entrapped moisture, if any.
- 4. Nuclear Hydrogen Detection Testing: Testing agency shall survey entire roof area for entrapped water within roof assembly according to ANSI/SPRI/RCI NT-1.
 - a. Perform tests before overlying construction is placed.
 - b. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency shall prepare survey report indicating locations of entrapped moisture, if any.
- 5. Low-Voltage Electrical Conductance Testing: Testing agency shall survey entire roof area and flashings to locate discontinuity in the roof membrane using an exposed metal electrical loop to create an electrical field tested with handheld probes.
 - a. Perform tests before overlying construction is placed.
 - b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.
- 6. High-Voltage Spark Testing: Testing agency shall survey entire roof area, flashings, and parapet walls to locate discontinuity in the roof membrane using an electrically charged metal "broom head."
 - a. Perform tests before overlying construction is placed.
 - b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.
 - 1) Cost of retesting is Contractor's responsibility.
- 7. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.

- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.11 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.12 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: **<Insert name of Owner>**.
 2. Address: **<Insert address>**.
 3. Building Name/Type: **<Insert information>**.
 4. Address: **<Insert address>**.
 5. Area of Work: **<Insert information>**.
 6. Acceptance Date: _____.
 7. Warranty Period: **<Insert time>**.
 8. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding **<Insert mph (m/s)>**;
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION

SECTION 07 62 00
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. This Section includes the following:

- 1. Manufactured Sheet Metal Flashing Products:
 - a. Manufactured reglets and counter flashing.
- 2. Formed Sheet Metal Flashing Products:
 - a. Formed sheet metal flashing and trim.
 - b. Formed rain drainage sheet metal fabrications.
 - c. Formed roof 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 roof and wall panels for installation of sheet metal flashing and trim integral with roof and wall panel systems.
- 3. Division 07 Sections as applicable to roofing for installation of sheet metal flashing and trim integral with roofing systems.
- 4. Division 07 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 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. 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.

1.4 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- C. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop and field-assembled work. Include the following:
 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 4. Details of termination points and assemblies, including fixed points.
 5. Details of 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.
- D. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" and NRCA's Roofing and Waterproofing Manuals as applicable to project conditions. Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.6 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.
- C. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

1.7 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.
 - 1. Coordinate with installation of work that affects sheet metal flashing and trim including installers of roof materials, roof accessories, unit skylights, and roof-mounted equipment.

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 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.

1. As-Milled Finish: Mill finish.
 2. Surface: Smooth, flat.
 3. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
 4. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - a. Color: As selected by Architect from full range of industry colors and color densities.
 - b. Color Range: 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.
 5. Exposed Coil-Coated Finishes:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 6. Color: As selected by Architect from manufacturer's full range.
 7. 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: 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 (Z275) coating designation; structural quality. Minimum 0.02 inch (0.6 mm) thick base metal, shop pre-coated with PVDF coating.
 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
 3. Surface: Smooth, flat.
 4. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 5. Color: As selected by Architect from manufacturer's full range.
 6. 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.

- D. Stainless Steel: ASTM A666 Type 304, soft temper, 0.015 inch (0.4 mm) thick; smooth No. 4 finish.
- E. Copper: ASTM B370, cold rolled 16 oz/sq ft (0.5 mm) thick; natural finish.

2.2 UNDERLAYMENT MATERIALS

- A. Polyethylene Sheet: 6-mil thick polyethylene sheet complying with ASTM D 4397.
- B. Felt: ASTM D 226, Type I (No. 15), asphalt-saturated organic felt, nonperforated.
- C. SBS Polymer Modified Fiberglass Base Sheet: Smooth surface self adhering underlayment complying with ASTM D4601 Type II.

2.3 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 nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, Type I, asbestos free, of consistency required for application.

2.4 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.

2.5 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.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to square profile, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch long 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. Gutters: Fabricate from 0.034 inch (22 gage) thick galvanized steel.
- B. Splash Pans: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

2.7 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 the following material:
1. Lead: 4.0-lb/sq.ft., hard tempered.
- E. Roof-Drain Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

2.8 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.
- B. Drip Edges: Fabricate from 0.028 inch (24 gage) thick galvanized steel.
- C. Eave, Rake Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.
- D. Base Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.
- E. Roof-Penetration Flashing: Fabricate from 0.028 inch (24 gage) thick galvanized steel.

2.9 WALL SHEET METAL FABRICATIONS

- A. Through-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.

- B. Wall Expansion-Joint Cover: 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 roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
 - 3. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 4. 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. SBS Underlayment: Install self-adhering in shingle fashion to shed water, with lapped joints of not less than 2 inches.

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. Provide elbows at base of downspout to direct water away from building.
 - 2. Connect downspouts to underground drainage system where indicated.
- A. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in asphalt roofing cement or elastomeric sealant compatible with roofing membrane.
- B. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper discharge.
- C. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches (100 mm) in direction of water flow.

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 staggered 3-inch centers.
- C. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.
 - 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 07 72 33
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 guardrail.
- 3. Ladder safety post.

B. Related Sections:

- 1. Division 05 Section "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
- 2. Division 05 Section "Pipe and Tube Railings" for safety railing systems not attached to roof-hatch curbs.
- 3. Division 07 Section "Roof Specialties" for manufactured fasciae, copings, gravel stops, gutters and downspouts, and counterflashing.

1.3 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of roof hatches and accessories with roofing system, flashing, and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate rough framing opening size with roof framing.
- C. Coordinate location of roof hatch with roof drainage system; do not locate roof hatches where roof drainage routes will be interrupted.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.
 - 1. Factory Coating: Manufacturer's standard factory-applied, baked-on epoxy primer coat, baked enamel or powder-coat finish with a minimum dry film thickness of 0.2 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.

2.2 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 AWWA 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.

2.3 ROOF HATCH

- 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.
- B. Type and Size: Single-leaf lid, 30 by 36 inches.
- C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- D. Hatch Material: Zinc-coated (galvanized) steel sheet, 0.079 inch (14 gage) thick.
 1. Finish: Baked enamel or powder coat finish.
 2. Color: As selected by Architect from manufacturer's full range.
- E. Construction:
 1. Curb Insulation: Cellulosic fiber board.
 2. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 3. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.

4. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
 5. Fabricate curbs to minimum height of 12 inches unless otherwise indicated.
 6. Sloping Roofs: Where slope or 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.
- F. Hardware: Galvanized steel spring latch with turn handles, butt or pintle-type hinge system, and padlock hasps inside and outside.
- G. 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; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Height: 42 inches 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: System constructed to prevent passage of a sphere 21 inches in diameter.
 4. 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.
- H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
 2. Height: 42 inches above finished roof deck.
 3. Material: Steel tube.
 4. Post: 1-5/8-inch diameter pipe.
 5. Finish: Manufacturer's standard baked enamel or powder coat finish.

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.
 - 3. Attach safety railing system to roof-hatch curb.
 - 4. Attach ladder-assist post according to manufacturer's written instructions.

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 07 84 13
PENETRATION FIRESTOPPING

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. Penetration firestopping for pipes, conduit, wires, and similar items passing through or penetrating vertical and horizontal smoke and/or fire resistance rated separations.
- 2. Firestopping for top of wall termination/sealing for smoke and/or fire resistance rated wall separations to other construction.

- B. Related Sections:

- 1. Division 07 Section "Joint Firestopping" for joints in or between fire-resistance-rated construction.
- 2. Division 09 Section "Gypsum Board" for gypsum board finish wall.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.

- B. Product Data: For each type of product indicated.

- C. Shop Drawings: For each penetration firestopping system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestopping design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

- 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

- D. Firestopping Schedule: Indicate locations of each penetration firestop system, along with the following information:

1. Type(s) of construction penetrated.
2. Type(s) of penetration items.
3. Firestopping design designation of qualified testing and inspection agency.

E. Qualification Data: For qualified Installer.

F. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Source Limitations for Installation: Penetration firestopping systems shall be installed by a single installer.

C. Source Limitations for Products: Obtain penetration firestopping systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by UL in its "Fire Resistance Directory."

E. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate work of all trades to ensure that penetration firestopping for all work is installed by one installer.
- B. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- C. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.
- D. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.
- E. Do not cover up penetration firestopping system installations that will become concealed behind other construction until each installation has been labeled, examined by Owner's inspecting agency, and building inspector if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M Fire Protection Products.
 - 2. Grabber Construction Products.
 - 3. Hilti, Inc.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

- B. Penetrations in Fire-Resistance-Rated Vertical and Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 2. T-Rating for Horizontal Assemblies: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 3. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m.) at both ambient and elevated temperatures.
 4. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
 - a. Provide W-rated firestopping systems at floor penetrations in rooms where floor sinks or floor drains are located.
- C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
 - 2. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

3. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
4. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels at each surface penetrated. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Applicable firestopping system designation and testing and inspecting agency.
 4. Date of installation.
 5. Manufacturer's name.
 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Provide UL-classified systems indicated as referenced to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Concrete Floor/Ceiling/Roof Penetrations:
 - 1. Metallic Pipes: FE 1001-1999.
 - 2. Insulated Metal Pipes: FE 5001-5999.
 - 3. Non-Metallic Pipes: FE 2001-2999.
 - 4. Sheet Metal Ducts: FE 7001-7999.
 - 5. Cable Trays: FE 3001-3999.
- C. Concrete and Masonry Wall Penetrations:
 - 1. Blank Opening: CAJ 0001-0999, FA 0001-0999, WJ 0001-0999.
 - 2. Metallic Pipes: CAJ 1001-1999.
 - 3. Insulated Metallic Pipes: CAJ 5001-5999.
 - 4. Non-Metallic Pipes: CAJ 2001-2999, FA 2001-2999, WJ 2001-2999.
 - 5. Sheet Metal Ducts: CAJ 7001-7999, WJ 7001-7999.
 - 6. Miscellaneous Electrical Items: CAJ 6001-6999.
 - 7. Cable Trays: CAJ 3001-3999, WJ 3001-3999.
- D. Gypsum Board Wall Penetrations:
 - 1. Blank Opening: WL 0001-0999.
 - 2. Metallic Pipes: WL 1001-1999.
 - 3. Insulated Metallic Pipes: WL 5001-5999.
 - 4. Non-Metallic Pipes: WL 2001-2999.
 - 5. Sheet Metal Ducts: WL 7001-7999.
 - 6. Miscellaneous Electrical Items: WL 6001-6999.
 - 7. Cable Trays: WL 3001-3999.
- E. Gypsum Board Wall Terminations:
 - 1. Top of Wall to Concrete/Metal Deck: HWD 0001-0999.
- F. Wood Floor Penetrations:
 - 1. Blank Openings: FC 0001-0999.
 - 2. Metallic Pipes: FC 1001-1999.
 - 3. Insulated Metal Pipes: FC 5001-5999.
 - 4. Non-Metallic Pipes: FC 2001-2999.
 - 5. Sheet Metal Ducts: FC 7001-7999.
 - 6. Cable Trays: FC 3001-3999.

END OF SECTION

SECTION 07 84 43
JOINT FIRESTOPPING

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. Joints in or between fire-resistance-rated constructions.
 - 2. Joints in smoke barriers.

- B. Related Sections:

- 1. Division 07 Section "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.
 - 2. Division 09 Section "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.
 - 3. Division 09 Section "Gypsum Board" for gypsum board finish wall.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product.
- C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
- D. Qualification Data: For qualified Installer.
- E. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.
- F. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing joint firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted

in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

- B. Source Limitation for Installation: Joint firestopping system shall be installed by a single installer.
- C. Source Limitation for Products: Obtain joint firestopping systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.
- D. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M Fire Protection Products.
 - 2. Grabber Construction Products.
 - 3. Hilti, Inc.

2.3 JOINT FIRESTOPPING SYSTEMS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.
 - 1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
 - 1. L-Rating: Not exceeding 5.0 cfm/ft. (0.00775 cu. m/s x m) of joint at both ambient and elevated temperatures.
- D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
- E. Accessories: Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:
 - 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
 - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Applicable firestopping system designation and applicable inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

- A. Provide UL-classified systems indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Floor-to-Floor, Joint Firestopping Systems:
 1. UL-Classified Systems: FF-D 0000-0999.
 2. Assembly Rating: 1 hour.
- C. Wall-to-Wall, Joint Firestopping Systems:
 1. UL-Classified Systems: WW-D 0000-0999.
 2. Assembly Rating: 1 hour.
- D. Floor-to-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: FW-D- 0000-0999.
 2. Assembly Rating: 1 hour.
- E. Head-of-Wall, Fire-Resistive Joint Firestopping Systems:
1. UL-Classified Systems: HW-D 0000-0999.
 2. Assembly Rating: 1 hour.
- F. Bottom-of-Wall, Joint Firestopping Systems:
1. UL-Classified Systems: BW-S-0000-0999.
 2. Assembly Rating: 1 hour.
- G. Wall-to-Wall, Joint Firestopping Systems Intended for Use as Corner Guards:
1. UL-Classified Systems: CG-D-0000-0999.
 2. Assembly Rating: 1 hour.
- H. Perimeter Joint Firestopping Systems:
1. UL-Classified Perimeter Fire-Containment Systems: CW-D 0000-0999.
 2. Integrity Rating: 1 hour.

END OF SECTION

SECTION 07 92 00
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.
2. Polyurethane joint sealants.
3. Acrylic joint sealant.
4. Butyl joint sealant.
5. Epoxy joint sealant.
6. Acoustical joint sealants.
7. Joint sealant backings.

B. Related Sections:

1. Division 07 Section "Joint Firestopping" for sealing joints in fire-resistance-rated construction.
2. Division 07 Section "Penetration Firestopping" for sealing penetrations in fire-resistance-rated construction.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application for each kind of sealant and joint substrate indicated.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
 - a. 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.

- 1) 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.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each joint-sealant product indicated.
- C. 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.
- D. 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.
- E. 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.
- F. Qualification Data: For qualified Installer.
- G. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- I. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- J. Field-Adhesion Test Reports: For each sealant application tested.
- K. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
- E. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 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.

1.7 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Contractor and Installer agree 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's standard form in which joint-sealant 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 specified in this article 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. Include coverage for installed sealants and accessories which fail to achieve airtight seal and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.
- E. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Sealants: VOC content of sealants shall comply with requirements of authorities having jurisdiction. Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 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 specified 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.

2.2 MANUFACTURERS

- A. Gunnable and Pourable Sealants:
 - 1. BASF Construction Chemicals-Building Systems
 - 2. Bostik Inc.
 - 3. Pecora Corporation
 - 4. Tremco Global Sealants
- B. Silicone Sealants:
 - 1. Bostik Inc., Pure Silicone, 100% Neutral-Cure Silicone
 - 2. Pecora Corporation; 890NST Ultra Low Modulus Architectural Silicone Sealant-Class 100
 - 3. Tremco Global Sealants, Spectrem 3
- C. Polyurethane Sealants:
 - 1. Bostik Inc.
 - 2. Pecora Corporation; DynaTrol I-XL General Purpose One Part Polyurethane Sealant
 - 3. Sherwin-Williams Company; Stampede-1/-TX Polyurethane Sealant
- D. Acrylic Sealants (ASTM C 920):
 - 1. Tremco Global Sealants
 - 2. Sherwin-Williams Company; Shermax Urethanized Elastomeric Sealant
- E. Butyl Sealants:
 - 1. Bostik Inc.
 - 2. Pecora Corporation
 - 3. Tremco Global Sealants
- F. Epoxy Sealants:
 - 1. Pecora Corporation; Dynapoxy EP-1200 Two-Part Epoxy Security Sealant
- G. Preformed Compressible Foam Sealers:
 - 1. EMSEAL Joint Systems, Ltd
 - 2. Sandell Manufacturing Company, Inc
 - 3. Dayton Superior Corporation
 - 4. Tremco Global Sealants

2.3 SEALANTS

- A. Type Exterior - General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.
 - 1. Color: Match adjacent finished surfaces.
 - 2. Applications:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior joints for which no other sealant is indicated.
 - 3. Polyurethane Products:

- a. Pecora Corporation; DynaTrol I-XL General Purpose One Part Polyurethane Sealant
 - b. Dymonic: Tremco.
 - c. Sikaflex 1a: Sika Corporation.
- B. Type Metal surfaces - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
 - 1. Product: BA-98 manufactured by Pecora.
 - 2. Product: Tremco butyl sealant
 - 3. Applications:
 - a. Concealed sealant bead in sheet metal work.
 - b. Concealed sealant bead in siding overlaps.
 - c. Bedding door thresholds.
- C. Type Interior - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
 - 1. Color: To be selected by Architect from manufacturer's standard range.
 - 2. Applications:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
- D. Type Non-pick - Nonsag Tamper-Resistant Sealant: ASTM C920, Grade NS, Class 12-1/2, Uses M, G, and A; single or multi- component.
 - 1. Type: Polyurethane.
 - 2. Color: Match adjacent finished surfaces.
 - 3. Color: To be selected by Architect from manufacturer's standard range.
 - 4. Products:
 - a. Pecora Corporation; DynaFlex Flexible Polyurethane Security Sealant
 - b. Pecora Corporation; DynaFlex SC Polyurethane STPU Security Sealant
- E. Type Bath - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; Single component, mildew resistant.
 - 1. Applications:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
 - b. Joints between kitchen and bath countertops and wall surfaces.
 - 2. Products:
 - a. Pecora Corporation; 898NST Sanitary Silicone Sealant-Class 50
- F. Type Acoustic - Acoustical Sealant for Concealed Locations:
 - 1. Composition: Acrylic latex emulsion sealant.
 - 2. Applications: Use for concealed locations only:
 - a. Sealant bead between top stud runner and structure and between bottom stud track and floor.
 - 3. Products:
 - a. Pecora Corporation; AIS-919 Acoustical and Insulation Latex Sealant
 - b. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant
 - c. Hilti, Inc.; CP 506 Smoke and Acoustical Sealant
- G. Type Floor - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single component.

1. Color: Match adjacent finished surfaces.
 2. Applications:
 - a. Expansion joints in floors.
 3. Products:
 - a. Pecora Corporation; NR-201 Self-Leveling Traffic and Loop Sealant
 - b. BASF Construction Chemicals-Building Systems
- H. Type Traffic - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component.
1. Color: Color as selected.
 2. Applications:
 - a. Joints in sidewalks and vehicular paving.
 3. Products:
 - a. Pecora Corporation; NR-201 Self-Leveling Traffic and Loop Sealant
 - b. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant
- I. Type Butyl - Butyl Sealant: ASTM C920, Grade NS, Class 12-1/2, Uses NT, M, A, G, O; single component, solvent release, non-skinning, non-sagging.
1. Color: Match adjacent finished surfaces.
 2. Products:
 - a. Bostik Inc.
 - b. Pecora Corporation
- J. Type Glazing - Silicone Sealant: ASTM C920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.
1. Color: To be selected by Architect from manufacturer's standard range.

2.4 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 oversized 30 to 50 percent larger than joint width to control sealant 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.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous 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 nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent 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. Verify that joint baking and release tapes are compatible with sealant.
- C. 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 laitance and form-release agents from concrete.
 - 2. 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.
 - 3. 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.

4. Clean nonporous 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. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. 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.
- 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. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces.
- C. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- D. 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

- F. 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.
- G. 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.
- H. Tooling of Nonsag 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.
- I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

- A. 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.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance 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.

3.5 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.

3.6 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.

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. Interior standard steel doors and frames.
 - 2. Exterior standard steel doors and frames.

- B. Related Requirements:

- 1. Division 01 Section "Substitution Procedures".
 - 2. Division 08 Section "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings and finishes.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 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 electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 7. Details of anchorages, joints, field splices, and connections.
 - 8. Details of accessories.
 - 9. Details of moldings, removable stops, and glazing.
- D. Samples for Initial Selection: For hollow-metal doors and frames with factory-applied color finishes.
- E. Samples for Verification:
 - 1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches
 - 2. Fabrication: Prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
- F. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 - 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 - 3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly, fire-rated borrowed-lite assembly, [windborne-debris impact resistance door and] thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.
- C. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.
- D. Field quality control reports.

1.8 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.9 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.

- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Stiles Custom Metals, Inc.
- B. Ceco Door
- C. ASI, Inc.
- D. Architect approved equal.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: 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 according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
 - 2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
- B. Fire-Rated, Borrowed-Lite Assemblies: 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 according to NFPA 257 or UL 9.
- C. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 1 for basic protection.
 - 1. Large-Missile Test: For glazed openings located within [30 feet (9.1 m)] of grade.
- D. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.38 deg Btu/F x h x sq. ft. (2.16 W/K x sq. m) when tested according to ASTM C518.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At all interior locations unless otherwise noted.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
 - d. Edge Construction: Model 1, Full Flush.
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - f. Core: Manufacturer's standard.
 - g. Fire-Rated Core: Manufacturer's standard doors.
 - 2. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.
 - 3. Exposed Finish: Prime.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. At all exterior locations unless otherwise noted.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches (44.5 mm).
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
 - d. Edge Construction: Model 1, Full Flush ANSI/SDI A250.8 allows the edge bevel to be determined by manufacturer unless otherwise indicated.
 - e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.

- g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping] 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.
 - h. Core: Manufacturer's standard.
 - i. Fire-Rated Core: Manufacturer's standard core for fire-rated doors.
2. Frames:
- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) coating.
 - b. Construction: Full profile welded.
3. Exposed Finish: Prime.

2.5 BORROWED LITES

- A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
- B. Construction: Full profile welded.
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.7 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 (610 mm) of frame height above 7 feet (2.1 m).
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) 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.

- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) 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.

2.8 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **[25]** percent.
- B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- H. Glazing: Comply with requirements in Section 088000 "Glazing."

2.9 FABRICATION

- A. Door 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 (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. 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. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Door Silencers: Except on weather-stripped frames, 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.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted hairline joints.
1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
 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. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.10 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 ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.11 LOUVERS

- A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch- (0.5-mm-) thick, cold-rolled steel sheet set into 0.032-inch- (0.8-mm-) thick steel frame.
 - 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
 - 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
 - 3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.
- B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

PART 3 - EXECUTION

3.1 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. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with ANSI/SDI A250.1.
 - 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 postinstalled expansion anchors.

- a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- 4. Solidly pack mineral-fiber insulation inside frames.
- 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
- 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- 7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
 - 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in [NFPA 80] [and] [NFPA 101].

3.4 REPAIR

- A. 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.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 08 12 00
INTERIOR ALUMINUM FRAMES
(ALTERNATE)

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 for windows.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, 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.

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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: Drawings and Specifications are based on the following:
 - a. Special-Lite, Omega Interior Aluminum Framing (Type II Frame).
 - b. Subject to compliance with requirements, provide products indicated or comparable products by:
 - 1) Modulex Products, Inc.
 - 2) Kawneer North America; an Arconic company.

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 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

- B. Door Framing: Profiles having integral stops and designed for 1-3/4 inch thick wood 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: 2 by 5/8 inches.
- E. Brackets and Reinforcements: Manufacturer's standard with nonstaining, nonferrous shims for aligning system components.
- F. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding 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.
 - 4. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- C. 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. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: Clear Anodized.

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 $\pm 1/16"$.
- 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.
 - 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

SECTION 08 14 16
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 doors with wood veneer faces.
 - 2. Factory finishing of solid core doors.

- B. Related Sections:

- 1. Division 08 Section "Aluminum Framed Entrances and Storefronts" for door frames for wood doors.
 - 2. Division 08 Section "Hollow Metal Doors and Frames"
 - 3. Division 08 Section "Door Hardware" for door hardware for wood doors.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of door. Include details of core and edge construction and trim for openings.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of cutouts.
- D. 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.
- E. Samples for Initial Selection: For factory-finished doors.
- 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 PROJECT 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's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty 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 through one source from a single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: Custom Grade, in accordance with WDMA I.S.1-A, "Architectural Wood Flush Doors" for Grades indicated.
 - a. WDMA I.S.1-A Performance Grade: Heavy Duty unless otherwise indicated.
- B. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- C. Particle Board Core Doors: Particleboard, ANSI A208.1, Grade LD-2 made with binder containing no urea-formaldehyde resin.
 - 1. Blocking: Provide 5-inch top-rail blocking in particleboard-core doors indicated to have closers.
 - 2. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- D. Structural-Composite-Lumber-Core Doors: Structural Composite Lumber, WDMA I.S.10.
 - 1. Screw Withdrawal: Face 700 lbf, edge: 400 lbf.
- E. Mineral-Core Doors: Noncombustible mineral core complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 - 1. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware and as follows:
 - a. 5-inch top-rail blocking.
 - b. 5-inch bottom-rail blocking.
 - c. 4-1/2-by-10-inch lock blocks or 5-inch midrail blocking in doors indicated to have exit devices.
 - 2. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
- F. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 - 1. Grade: Custom with Grade A faces.
 - 2. Species: Cedar.
 - 3. Cut: Plain cut.

4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
8. Exposed Vertical Edges: Applied wood edges of same species as faces and covering edges of crossbands.
9. Core: Particleboard unless otherwise indicated.
 - a. Structural composite lumber core for doors with exit devices,
 - b. Mineral core where required for fire resistance rating.
10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
11. WDMA I.S.1-A Performance Grade: Heavy Duty.

2.4 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 aluminum frames to verify dimensions and alignment before factory machining.
 2. Coordinate locations of conduit and wiring boxes for electrical connection with Division 26 Sections. Provide electrical raceways for electric hardware.
- C. Openings: Cut and trim openings through doors in factory.

2.5 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Transparent Finish:
 1. Grade: Premium Custom.

2. Finish: WDMA TR-4 conversion varnish or TR-6 catalyzed polyurethane.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames 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, see Division 08 Section "Door Hardware."
- B. Installation: Install doors to comply with manufacturer's written installation instructions and referenced quality standards 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. 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 08 31 13
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 the following:
 - 1. Access doors and frames for walls and ceilings.
- B. Related Sections include the following:
 - 1. Division 07 Section "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke-barriers.
 - 2. Division 09 Section "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.
 - 3. Division 09 Section "Gypsum Board" for framed gypsum wall board and ceilings.
 - 4. Division 09 "Painting" for painting of cold rolled steel.
 - 5. Division 22 "Plumbing"
 - 6. Division 23 "Heating, Ventilation, and Air Conditioning"

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of access door and frame indicated. Include construction details, materials, individual components and profiles, and finishes.
- C. 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 QUALITY ASSURANCE

- A. Source Limitations: Obtain access doors and frames through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for vertical access doors and frames.
 2. NFPA 288 for fire-rated access door assemblies installed horizontally.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 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 STEEL MATERIALS

- A. Steel Sheet: Uncoated cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
1. Commercial quality, cold steel sheet with baked on rust inhibitive gray primer.

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. Dur-Red Products.
 2. J. L. Industries, Inc.
 3. Karp Associates, Inc.
 4. Larsen's Manufacturing Company.
 5. Milcor Inc.
 6. Nystrom, Inc.
- B. Non-Fire Rated Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
1. Locations: Non-fire rated wall and ceiling surfaces of painted gypsum board.
 2. Door: Minimum 0.075-inch (14 gage) thick sheet metal, set flush with exposed face flange of frame.
 3. Frame: Minimum 0.060-inch (16 gage) thick sheet metal with 1-inch wide, surface-mounted trim.
 4. Door Size: As indicated on Drawings.
 5. Hinges: Spring-loaded, concealed-pin type.
 6. Latch: Cam latch operated by screwdriver with interior release.
- C. Non-Fire Rated Flush Access Doors and Frames with Exposed Trim: Fabricated from stainless steel sheet.
1. Locations: Non-fire rated wall and ceiling surfaces.

2. Door: Minimum 0.075-inch (14 gage) thick sheet metal, set flush with exposed face flange of frame.
 3. Frame: Minimum 0.060-inch (16 gage) thick sheet metal with 1-inch wide, surface-mounted trim.
 4. Door Size: As indicated on Drawings.
 5. Hinges: Spring-loaded, concealed-pin type.
 6. Latch: Cam latch operated by screwdriver with interior release.
 7. Lock: Key operated cylinder cam lock.
- D. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
1. Locations: Fire rated walls and ceilings of painted gypsum board finish and/or CMU walls as indicated on Drawings.
 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
 4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch (20 gage).
 5. Frame: Minimum 0.060-inch (16 gage) thick sheet metal with 1-inch wide, surface-mounted trim.
 6. Door Size: As indicated on Drawings.
 7. Hinges: Continuous piano hinge.
 8. Automatic Closer: Spring type.
 9. Latch: Self-latching device operated by knurled knob with interior release.

2.3 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. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

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.
- 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.

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.

END OF SECTION

SECTION 083313
COILING COUNTER 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. Counter door assemblies.
 - 2. Fire-rated counter door assemblies.

- B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for door-opening framing and corner guards.
 - 2. Section 099123 "Interior Painting" for finish painting of factory-primed doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling counter door and accessory.

- 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 - 3. Include description of automatic closing device and testing and resetting instructions.

- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

- 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 4. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.

5. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 1. Curtain slats..
 2. Bottom bar.
 3. Guides.
 4. Brackets.
 5. Hood.
 6. Laminate-clad counter panel product for each type, color, pattern, and surface finish; laminated to core.
 7. Locking device(s).
 8. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer:
 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.
 2. Manufacturer's approval.
- B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.
 - 1. Obtain operators and controls from coiling counter door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Complying with NFPA 80; listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Limit: Where indicated provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 - 3. Smoke Control: Where indicated, provide doors that are listed and labeled with the letter "S" on the fire-rating label by a qualified testing agency for smoke- and draft-control based on testing according to UL 1784; with maximum air-leakage rate of 3.0 cfm/sq. ft. (0.01524 cu. m/s x sq. m) of door opening at 0.10 inch wg (24.9 Pa) for both ambient and elevated temperature tests.
- B. Sound-Control Doors: Assemblies tested in a laboratory for sound-transmission-loss performance according to ASTM E90, calculated according to ASTM E413, and rated for not less than the STC value indicated.

2.3 COUNTER DOOR ASSEMBLY

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
 - 1. Cookson ESC10 or Architect approved equal.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.
- C. STC Rating: 26
- D. Curtain R-Value: 6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W).
- E. Door Curtain Material: Stainless steel.
- F. Door Curtain Slats: Flat profile slats of 1-1/2-inch high 1/2 inch deep, minimum 22 gauge AISI type 304 #4 finish stainless.
 1. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated stainless steel and finished to match door.
- H. Curtain Jamb Guides: 12 gauge stainless steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- I. Hood: Stainless steel, 24 gauge.
 1. Shape: As indicated on Drawings.
 2. Mounting: As indicated on Drawings.
- J. Integral Frame, Hood, and Fascia: Stainless steel.
 1. Mounting: As indicated on Drawings.
- K. Sill Configuration: As indicated on Drawings.
- L. Locking Devices: Equip door with locking device assembly.
 1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside with thumbturn
- M. Electric Door Operator:
 1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
 2. Operator Location: As indicated on Drawings.
 3. Motor Exposure: Interior.
 4. Motor Electrical Characteristics:
 - a. Horsepower: 1/2 hp.
 - b. Voltage:
 - 1) 115-V ac, single phase, 60 Hz.
 5. Emergency Manual Operation: Push-up type.
 6. Obstruction-Detection Device: Automatic photoelectric sensor.

- 7. Control Station(s): Where indicated on Drawings.
- N. Curtain Accessories: Equip door with automatic closing device.
- O. Door Finish:
 - 1. Stainless Steel Finish: ASTM A480/A480M No. 4 (polished directional satin)].
 - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 FIRE-RATED COUNTER DOOR ASSEMBLY

- A. Fire-Rated Counter Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats.
 - 1. Cookson ERC11 or Architect approved equal
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - 1. Include tamperproof cycle counter.
- C. Fire Rating: 1 hour with smoke control.
- D. STC Rating: 27.
- E. Curtain R-Value: 6.0 deg F x h x sq. ft./Btu.
- F. Door Curtain Material: Stainless steel.
- G. Door Curtain Slats: Flat profile slats of 1-1/2 center-to-center height.
 - 1. Insulated-Slat Interior Facing: Stainless steel.
- H. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.
- I. Hood: Stainless steel.
 - 1. Shape: As indicated on Drawings.
 - 2. Mounting: As indicated on Drawings.
- J. Integral Frame, Hood, and Fascia: Stainless steel.
 - 1. Mounting: As indicated on Drawings.
- K. Sill Configuration: As indicated in Drawings
- L. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside with thumbturn.

M. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: As indicated on Drawings.
3. Motor Exposure: Interior.
4. Motor Electrical Characteristics:
 - a. Horsepower: 1/2 hp.
 - b. Voltage:
 - 1) 115-V ac single phase, 60 Hz.
5. Emergency Manual Operation: Push-up type.
6. Obstruction-Detection Device: Automatic photoelectric sensor
7. Control Station(s): Where indicated on Drawings.

N. Curtain Accessories: Equip door with smoke seals, automatic closing device.

O. Door Finish:

1. Stainless Steel Finish: ASTM A480/A480M No. 4 (polished directional satin).
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.5 SECURITY DOOR ASSEMBLY

A. Security Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Cookson ESG10 or Architect approved equal

B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Fire Rating: None.

D. STC Rating: None.

E. Curtain R-Value: None.

F. Door Curtain Material: Stainless steel.

G. Door Curtain Slats: Flat profile slats of 1-1/2 center-to-center height.

1. Insulated-Slat Interior Facing: Stainless steel.
- H. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.
- I. Hood: Stainless steel.
 1. Shape: As indicated on Drawings.
 2. Mounting: As indicated on Drawings.
- J. Integral Frame, Hood, and Fascia: Stainless steel.
 1. Mounting: As indicated on Drawings.
- K. Sill Configuration: As indicated on Drawings
- L. Locking Devices: Equip door with locking device assembly.
 1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside with thumbturn.

2.6 SERVICE DOOR ASSEMBLY

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
 1. Cookson ESD10 or Architect approved equal.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 1. Include tamperproof cycle counter.
- C. STC Rating: 26
- D. Curtain R-Value: 6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W).
- E. Door Curtain Material: Stainless steel.
- F. Door Curtain Slats: Flat profile slats of 1-1/2-inch high 1/2 inch deep, minimum 22 gauge AISI type 304 #4 finish stainless.
 1. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- G. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated stainless steel and finished to match door.
- H. Curtain Jamb Guides: 12 gauge stainless steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

- I. Hood: Stainless steel, 24 gauge.
 - 1. Shape: As indicated on Drawings.
 - 2. Mounting: As indicated on Drawings.
- J. Integral Frame, Hood, and Fascia: Stainless steel.
 - 1. Mounting: As indicated on Drawings.
- K. Sill Configuration: As indicated on Drawings.
- L. Locking Devices: Equip door with locking device assembly.
 - 1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside with thumbturn
- M. Electric Door Operator:
 - 1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
 - 2. Operator Location: As indicated on Drawings.
 - 3. Motor Exposure: Interior.
 - 4. Motor Electrical Characteristics:
 - a. Horsepower: 1/2 hp.
 - b. Voltage:
 - 1) 115-V ac, single phase, 60 Hz.
 - 5. Emergency Manual Operation: Push-up type.
 - 6. Obstruction-Detection Device: Automatic photoelectric sensor.
 - 7. Control Station(s): Where indicated on Drawings.
- N. Curtain Accessories: Equip door with automatic closing device.
- O. Door Finish:
 - 1. Stainless Steel Finish: ASTM A480/A480M No. 4 (polished directional satin)].
 - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.7 MATERIALS, GENERAL

- 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.

2.8 DOOR CURTAIN MATERIALS AND FABRICATION

- A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Stainless Steel Door Curtain Slats: ASTM A240/A240M or ASTM A666, Type 304; sheet thickness of 22 gauge; and as required.
 - 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
 - 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.
 - 1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.9 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Stainless Steel: 24 gauge thick, stainless steel sheet, Type 304, complying with ASTM A240/A240M or ASTM A666.
 - 2. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
- B. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):
 - 1. Stainless Steel: Type 304, complying with ASTM A240/A240M or ASTM A666.

2.10 LOCKING DEVICES

Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

- B. **Safety Interlock Switch:** Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.11 CURTAIN ACCESSORIES

- A. **Smoke Seals:** Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. **Astragal:** Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- C. **Push/Pull Handles:** Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- D. **Automatic-Closing Device:** Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Release mechanism for motor-operated doors shall allow testing without mechanical release of the door. Automatic-closing device shall be designed for activation by the following:
 - 1. Building fire-detection, smoke-detection, and -alarm systems.

2.12 COUNTER DOOR ACCESSORIES

- A. **Integral Metal Sill:** Fabricate sills as integral part of frame assembly of Type 304 stainless steel in manufacturer's standard thickness with [ASTM A480/A480M No. 4] <Insert finish> finish.
- B. **Fire-Rated, Laminate Counter:** Fire-door manufacturer's high-pressure, decorative laminate-covered countertop; UL or ITS tested and labeled for 1-1/2-hour fire rating for approved use with fire-door assembly.

2.13 COUNTERBALANCE MECHANISM

- A. **General:** Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
 - 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.14 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
 - 2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
 - 3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.

4. Bench Mounted: Operator is mounted to the right or left door head plate and connected to the door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
 5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of door.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel. For fire-rated doors, activation delays closing.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
 2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
 3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Type: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).
 - I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
 - J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.15 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.16 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 1. Run grain of directional finishes with long dimension of each piece.
 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 3. Directional Satin Finish: ASTM A480/A480M No. 4.
- C. Bright, Cold-Rolled, Unpolished Finish: ASTM A480/A480M No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Fire-Rated Doors: Install according to NFPA 80.
- D. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: **[Owner will engage] [Engage]** a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

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. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.6 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 coiling-door 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, seven-day-per-week, emergency callback service.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 083313

SECTION 08 41 13
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. Exterior storefront framing.
- 2. Exterior manual-swing entrance doors and door frame units.

B. Related Sections:

- 1. Division 08 Section "Glazing" for glass for glazing of aluminum storefront systems.
- 2. Division 08 Section "Door Hardware" for door hardware for aluminum entrance doors not specified in this section.
- 3. Division 08 Section "Aluminum Windows" for coordinating of finishes among aluminum fenestration units.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction. Failure includes the following:

- 1. Deflection exceeding specified limits.
- 2. Thermal stresses transferring to building structure.
- 3. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
- 4. Noise or vibration created by wind and by thermal and structural movements.
- 5. Loosening or weakening of fasteners, attachments, and other components.
- 6. Sealant failure.

B. Structural Loads:

- 1. Design Wind Loads: Storefront window system assemblies shall withstand wind loads determined according to ASCE/SEI 7 and the California Building Code.
 - a. Wind Loads: Uniform pressure (velocity pressure) of not less than 20 lbf/sq. ft., acting inward and outward.

2. Seismic Performance: Storefront window system assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the California Building Code.
 - a. 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."
- C. Deflection of Framing Members, 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.
- D. Structural Test Performance: Provide aluminum-framed systems tested 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, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members that would cause the storefront framing to be defective.
 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from a maximum change (range) in ambient temperature of 120 degrees F and surface temperature change of 180 degrees F.
- F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of not more than 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
- G. Water Penetration Under Static Pressure: Provide framing systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure of 12.0 psf.
- H. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factors (CRF) of not less than 57 (frame) and 70 (glass) when glazed with 1" (25 mm) insulated, 1/4" (6 mm) clear, 1/2" (12 mm) air, 1/4" (6 mm) clear glass and tested according to AAMA 1503.1.
- I. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.44 Btu/sq. ft. x h x deg F when glazed with 1" (25 mm) insulated, 1/4" (6 mm) clear, 1/2" (12 mm) air, 1/4" (6 mm) clear glass and tested according to AAMA 1503.1.

1.4 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- C. Shop Drawings: For aluminum-framed systems. 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 point-to-point wiring diagrams showing the following:
 - a. Power requirements for each electrically operated door hardware.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. 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.
- F. Qualification Data: For installer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.
- H. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- I. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- 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. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1, and the California Building Code.
- D. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.6 WARRANTY

- A. Special Warranty: Manufacturer 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, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

1.7 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.

PART 2 - PRODUCTS

2.1 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: Steel reinforcement indicated below finished with 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.

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.

2.2 ALUMINUM STOREFRONT FRAMING SYSTEMS

A. Manufacturer

B. 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 Arconic company.
 - a. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:
 - 1) United States Aluminum; a C.R. Laurence company.
 - 2) EFCO Corporation
 - 3) Oldcastle

C. Framing Members, General: Manufacturer's standard extruded-aluminum framing members of type and size indicated and as required to support imposed loads.

1. Construction: Thermal.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Center.
4. Glazing Thickness: 1 inch.
5. Hardware: Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
6. Finish: Clear anodized.

D. Basis of Design for Exterior Applications: Kawneer, Trifab VG 451T.

1. Size: 2 by 4-1/2 inches.
2. Wall Thickness: Not less than 0.080 inches.
3. Glazing: Center glazed, glazing may be installed from inside or outside, glazing thickness as indicated on drawings.
4. Finish: Clear anodized.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

F. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding 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. Where fasteners must be exposed, use countersunk Phillips flat head screws finished to match framing system or fabricated from stainless steel.
- G. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- H. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
1. Sealants shall be as 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).

2.3 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation fabricated from extruded-aluminum tubular stiles rails.
1. **Basis of Design: Kawneer, 250T Insulpour Thermal Entrances**
 - a. **Door Construction:** 1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm) overall thickness, with minimum 0.125-inch- (3.2-mm) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - b. **Thermal Construction:** The 'U'-Factor shall not be more than 0.52.
 - c. **Vertical Stiles:** Wide Stile, 2-1/2 inch nominal width.
 - d. **Top Rail:** Wide Stile, 2-15/16 inch nominal width.
 - e. **Bottom Rail:** 10 inches wide minimum not including glazing stops.
 - f. **Glazing:** 1 inch thick insulated glazing.
 - g. **Finish:** Clear Anodized.
- B. Glazing Stops and Gaskets: 0.050 inch thick, square, snap-on, extruded-aluminum stops and preformed gaskets.
1. Provide nonremovable glazing stops on outside of door.
- C. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."

2.4 GLAZING SYSTEMS

- 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. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."
- B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.6 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. 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. 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.
 - 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. Storefront Framing: Fabricate components for assembly using shear-block system.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
- G. 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.
- H. 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.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
1. Color: Clear

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas 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 INSTALLATION

- A. General:
1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Division 08 Section "Glazing."
- G. 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.
- H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 FIELD QUALITY CONTROL

- A. Testing: Testing and inspecting of representative areas of installed work shall take place as follows.
 - 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 the Architect shall be spray tested according to AAMA 501.2 and shall not evidence water penetration.

- a. Test Area: A minimum area of 75 square feet of aluminum-framed systems for each building.
- B. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- C. Inspection Reports: Inspection reports shall be prepared by the Owner's Inspector.
- D. Cost for successful tests shall be paid by owner. Unsuccessful tests shall be paid by contractor.

3.5 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 08 42 29
SLIDING AUTOMATIC ENTRANCES

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. Sliding automatic entrances.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for [installing recessed metal frames for control mats in concrete] [and] [forming recesses in concrete for recessed thresholds].
 - 2. Section 084243 "Intensive Care Unit/Critical Care Unit (ICU/CCU) Entrances" for swinging-sliding, manual ICU/CCU entrance door assemblies.
 - 3. Section 087113 "Automatic Door Operators" for automatic door operators furnished separately from doors and frames.

1.3 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
- C. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
- D. For automatic door terminology, refer to BHMA A156.10 for definitions of terms.

1.4 COORDINATION

- A. Coordinate sizes and locations of recesses in concrete floors for [recessed sliding tracks] [and] [recessed control mats] that control automatic entrances. Concrete, reinforcement, and formwork requirements are specified elsewhere.

- B. Templates: Distribute for doors, frames, and other work specified to be factory prepared for installing automatic entrances.
- C. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for automatic entrances with hardware required for rest of Project.
- D. Electrical System Roughing-in: Coordinate layout and installation of automatic entrances with connections to power supplies[and access-control system] [and remote activation devices] [and remote monitoring systems].
- E. System Integration: Integrate sliding automatic entrances with other systems as required for a complete working installation.
 - 1. Provide electrical interface control capability for activation of sliding automatic entrances by security access system on doors with electric locking.
 - 2. Provide electrical interface to deactivate door operators on activation of fire alarm system.
 - 3. Provide electrical interface to allow for remote monitoring of automatic entrance door panel status.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site] <Insert location>.

1.6 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 entrances.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For sliding automatic entrances.
 - 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. Include diagrams for power, signal, and control wiring.
 - 4. Indicate locations of activation and safety devices.
 - 5. Include hardware schedule and indicate hardware types, functions, quantities, and locations.
- C. Samples for Initial Selection: For units with factory-applied metal-clad finishes.
 - 1. Include Samples of hardware and accessories involving color or finish selection.

- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of automatic entrance. Include emergency-exit features of automatic entrances serving as a required means of egress.
- C. Product Test Reports: For each type of automatic entrance, for tests performed by a qualified testing agency.
- D. Field quality-control reports.
- E. Sample Warranties: For manufacturer's special warranties.

1.8 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For automatic entrances, safety devices, and control systems to include in operation and maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer with Company Certificate issued by AAADM indicating that manufacturer has a Certified Inspector on staff.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- C. Certified Inspector Qualifications: Certified by AAADM.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of automatic entrances 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. Faulty operation of operators, controls, and hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Two years from date of Substantial Completion.

- B. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 AUTOMATIC ENTRANCE ASSEMBLIES

- A. Source Limitations: Obtain sliding folding automatic entrances from single source from single manufacturer.
- B. 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.
- C. Power-Operated Door Standard: BHMA A156.10.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Seismic Loads: Refer to Structural Drawings.
 - 2. Wind Loads: Refer to Structural Drawings
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- C. Operating Temperature Range: Automatic entrances shall operate within minus 20 to plus 122 deg F
- D. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 1.25 cfm/sq. ft. of fixed entrance-system area when tested according to ASTM E283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft..
- E. Opening Force:

1. Power-Operated Doors: Not more than 50 lbf (222 N) required to manually set door in motion if power fails, and not more than 15 lbf (67 N) required to open door to minimum required width.
2. Breakaway Device for Power-Operated Doors: Not more than 50 lbf (222 N) required for a breakaway door or panel to open.

F. Entrapment-Prevention Force:

1. Power-Operated Sliding Doors: Not more than 30 lbf (133 N) required to prevent stopped door from closing.

2.3 SLIDING AUTOMATIC ENTRANCES

- A. General: Provide manufacturer's standard automatic entrances, including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, controls, and accessories required for a complete installation.

B. Sliding Automatic Entrance

1. Biparting Sliding Units:

- a. NABCO GT1175 Series
- b. Approved Equal

2. Operator Features:

- a. Power opening and closing.
- b. Drive System: Chain or belt.
- c. Adjustable opening and closing speeds.
- d. Adjustable hold-open time between zero and 30 seconds.
- e. Obstruction recycle.
- f. On-off/hold-open switch to control electric power to operator

3. Sliding-Door Carrier Assemblies and Overhead Roller Tracks: Carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered, ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.

- a. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.

4. Sliding-Door Threshold: Threshold members and bottom-guide-track system with stainless steel, ball-bearing-center roller wheels.

- a. Configuration, Threshold: Saddle-type threshold across door opening and recessed guide-track system at sidelites.

5. Controls: Activation and safety devices according to BHMA standards.

- a. Activation Device, Motion Sensor: Mounted on each side of door header to detect pedestrians in activating zone and to open door.
 - b. oor to detect pedestrians in activating zone and to open door.
 - c. Safety Device, Photoelectric Beams: Two photoelectric beams mounted in sidelite jambs on each side of door to detect pedestrians in presence zone and to prevent door from closing.
 - d. Sidelite Safety Device: Presence sensor, mounted above each sidelite on side of door opening through which doors travel, to detect obstructions and to prevent door from opening.
6. Finish: Finish framing, door(s), and header with finish matching adjacent storefront.

2.4 ENTRANCE COMPONENTS

- A. Framing Members: Extruded aluminum, minimum 0.125 inch (3.2 mm) thick and reinforced as required to support imposed loads.
 - 1. Nominal Size: 1-3/4 by 4-1/2 inches (45 by 115 mm)
 - 2. Extruded Glazing Stops and Applied Trim: Minimum 0.062-inch (1.6-mm) wall thickness.
- B. Stile and Rail Doors: 1-3/4-inch-thick, glazed doors with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.
 - 1. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - 2. Stile Design: Narrow stile, 2-1/8-in. nominal width].
 - 3. Rail Design: 5-inch (125-mm) nominal height]
- C. Sidelite(s) 1-3/4-inch- (45-mm-) deep sidelite(s) with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular stile and rail members matching door design.
 - 1. Glazing Stops and Gaskets: Same materials and design as for stile and rail door
- D. Headers: Fabricated from minimum 0.125-inch- (3.2-mm-) thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
 - 1. Mounting: Concealed, with one side of header flush with framing].
 - 2. Capacity: Capable of supporting doors of up to 175 lb (79 kg) per leaf over spans of up to 14 feet without intermediate supports.
 - a. Provide sag rods for spans exceeding 14 feet (4.3 m).
- E. Brackets and Reinforcements: High-strength aluminum with nonstaining, nonferrous shims for aligning system components.

F. Signage: As required by cited BHMA standard.

1. Application Process: Door manufacturer's standard process

2.5 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extrusions: ASTM B221 (ASTM B221M).

2. Sheet: ASTM B209 (ASTM B209M).

B. Steel Reinforcement: Reinforcement with corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Use surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

C. Stainless Steel Bars: ASTM A276/A276M or ASTM A666.

D. Stainless Steel Tubing: ASTM A554.

E. Glazing: As specified in Section 088000 "Glazing."

F. Sealants and Joint Fillers: As specified in Section 079200 "Joint Sealants."

G. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C1107/C1107M; of consistency suitable for application.

H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

I. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.6 DOOR OPERATORS AND CONTROLS

A. General: Provide operators and controls, which include activation and safety devices, according to BHMA standards, for condition of exposure, and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

B. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement.

1. Door Operator Performance: Door operators shall open and close doors and maintain them in fully closed position when subjected to Project's design wind loads.

2. Electromechanical Operators: Concealed, self-contained, overhead units powered by fractional-horsepower, permanent-magnet dc motor; with closing

speed controlled mechanically by gear train and dynamically by braking action of electric motor; with solid-state microprocessor controller; complying with UL 325; and with manual operation with power off.

- C. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units; fully enclosed by their plastic housings; adjustable to provide detection-field sizes and functions required by BHMA A156.10.
 - 1. Provide capability for switching between bi- and unidirectional detection.
 - 2. For one-way traffic, sensor on egress side shall not be active when doors are fully closed.
- D. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.

2.7 HARDWARE

- A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish.
- B. Breakaway Device for Power-Operated Doors: Device that allows door to swing out in direction of egress to full 90 degrees from any operating position. Maximum force to open door shall be as stipulated in "Performance Requirements" Article. Interrupt powered operation of door operator while in breakaway mode.
 - 1. Include one adjustable detent device mounted at the top of each breakaway panel to control breakaway force.
 - a. Panel Closer: Factory-installed concealed hydraulic door closer.
 - b. Limit Arms: Limit swing to 90 degrees, spring loaded with adjustable friction damping.
- C. Automatic Locking: Electrically controlled device mounted in header that automatically locks sliding door in closed position, preventing door panels from sliding manually.
 - 1. Power Interruption: Lock shall be disengaged, allowing doors to slide manually.
 - 2. Means of Egress: Standard breakaway feature.
 - 3. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.8 ACCESSORIES

- A. Guide Rails:
 - 1. Anodized aluminum, fabricated from bars, minimum 36 inches high, and finished to match doors unless otherwise indicated; positioned and projecting from face of

door jamb for distance as indicated Retain first subparagraph below if required; delete if shown on Drawings.

- a. Aluminum Finish: Finish matching door and frame

2.9 FABRICATION

- A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.
 - 1. Form aluminum shapes before finishing.
 - 2. 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.
 - 3. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws finished to match framing
 - a. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - b. Reinforce members as required to receive fastener threads.
 - 4. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
 - 1. Fabricate tubular and channel frame assemblies with welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support required loads.
 - 2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
 - 3. Form profiles that are sharp, straight, and free of defects or deformations.
 - 4. Provide components with concealed fasteners and anchor and connection devices.
 - 5. Fabricate components with accurately fitted joints, with ends coped or mitered to produce hairline joints free of burrs and distortion.
 - 6. Fabricate exterior components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior. Provide anchorage and alignment brackets for concealed support of assembly from building structure.
 - 7. Allow for thermal expansion of exterior units.
- C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
- D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.

- E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."
- F. Hardware: Factory install hardware to greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.
 - 1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors.
- G. Controls:
 - 1. General: Factory install activation and safety devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.
 - 2. Install photoelectric beams in vertical jambs of sidelites, with dimension above finished floor as follows:
 - a. Top Beam: [48 inches (1219 mm)] <Insert dimension>.
 - b. Bottom Beam: [24 inches (610 mm)] <Insert dimension>.

2.10 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- C. 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.

2.11 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm] [AA-M12C22A31, Class II, 0.010 mm] or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of automatic entrances.
- B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic entrance installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install automatic entrances according to manufacturer's written instructions and cited BHMA A156.10 for direction of pedestrian travel, including signage, controls, wiring, and connection to the building's power supply.
 - 1. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
 - 2. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 3. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous coating.
- B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
 - 1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - 2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
 - 3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
 - 4. Level recesses for recessed thresholds using nonshrink grout.
- C. Door Operators: Connect door operators to electrical power distribution system.
- D. Controls: Install and adjust activation and safety devices according to manufacturer's written instructions and cited BHMA standard for direction of pedestrian travel.
- E. Guide Rails: Install rails according to BHMA A156.10, including Appendix A, and manufacturer's written instructions unless otherwise indicated.
- F. Glazing: Install glazing as specified in Section 088000 "Glazing."
- G. Sealants: Comply with requirements specified in Section 079200 "Joint Sealants" to provide weathertight installation.
 - 1. Set thresholds, bottom-guide-track system, framing members and flashings in full sealant bed.
 - 2. Seal perimeter of framing members with sealant.
- H. Signage: Apply signage on both sides of each door as required by cited BHMA standard for direction of pedestrian travel.
- I. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

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 entrance, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.
- B. Automatic entrances will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust hardware, moving parts, door operators, and controls to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
 - 1. Adjust exterior doors for tight closure.
- B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 CLEANING

- A. Clean glass and metal surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.
 - 1. Comply with requirements in Section 088000 "Glazing" for cleaning and maintaining glass.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of automatic entrance Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper automatic entrance operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
2. Perform maintenance, including emergency callback service, during normal working hours.
3. Include 24-hour-per-day, 7-day-per-week emergency callback service.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION 084229

SECTION 08 51 13
ALUMINUM WINDOWS

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 aluminum windows for exterior locations.
- B. Related Requirements:
 - 1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.
 - 2. Section 084229 "Sliding Automatic Entrances" for coordinating finish among aluminum fenestration units.
 - 3. Section 088000 "Glazing" for coordination of glass units.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- C. Shop Drawings: For aluminum windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- D. Samples for Initial Selection: For units with factory-applied finishes.
- E. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
 - 1. Exposed Finishes: 2 by 4 inches (50 by 100 mm).

- F. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.
- G. Qualification Data: For manufacturer and Installer.
- H. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- I. Field quality-control reports.
- J. Sample Warranties: For manufacturer's warranties.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 2 years from date of Substantial Completion.
 - b. Glazing Units: Five years from date of Substantial Completion.
 - c. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: AAMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: AW.
 - 2. Minimum Performance Grade: 40.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.35 Btu/sq. ft. x h x deg F (2.0 W/sq. m x K).
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.
- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.
- F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F (67 deg C) ambient; 180 deg F (100 deg C) material surfaces.
- G. Sound Transmission Class (STC): Rated for not less than 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- H. Outside-Inside Transmission Class (OITC): Rated for not less than 30. OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

2.3 ALUMINUM WINDOWS

- A. Basis of Design Products: Drawings and specifications are based on the following:
 - a. Kawneer, Series 8225TLF Thermal Windows
 - b. Subject to compliance with requirements, provide products indicated or comparable products by one of the following:
 - 1) Manko Window Systems, Inc.
 - 2) YKK AP America Inc.
 - 3) Arcadia, Inc.

- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
1. Awning: Project out.
 2. Single hung.
 3. Fixed.
- C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- D. Glazing: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.
1. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- G. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

- E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.
- F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" 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.

2.6 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611.

1. Color: Black

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

- D. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
 - 3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.

4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
 - D. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes furnishing, installation and commissioning of mechanical and electro-mechanical door hardware for doors specified in “Hardware Sets” and required by actual conditions: including screws, bolts, expansion shields, electrified door hardware, and other devices for proper application of hardware.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- C. Related Divisions:
 - 1. Division 03 Concrete
 - 2. Division 06 Rough & Finish Carpentry
 - 3. Division 07 Joint Sealants
 - 4. Division 08 Openings
 - 5. Division 09 Finishes
 - 6. Division 26 Electrical
 - 7. Division 27 Communications
 - 8. Division 28 Electronic Safety And Security

1.02 REFERENCES

- A. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI):
 - 1. ANSI/BHMA A156.1 Butts & Hinges (2016)
 - 2. ANSI/BHMA A156.2 Bored & Preamsembled Locks & Latches (2011)
 - 3. ANSI/BHMA A156.3 Exit Devices (2014)
 - 4. ANSI/BHMA A156.4 Door Controls – Closers (2013)
 - 5. ANSI/BHMA A156.5 Cylinders and Input Devices for Locks (2014)
 - 6. ANSI/BHMA A156.6 Architectural Door Trim (2015)
 - 7. ANSI/BHMA A156.7 Template Hinge Dimensions (2016)
 - 8. ANSI/BHMA A156.8 Door Controls – Overhead Stops and Holders (2015)
 - 9. ANSI/BHMA A156.13 Mortise Locks & Latches (2012)
 - 10. ANSI/BHMA A156.18 Materials & Finishes (2016)
 - 11. ANSI/BHMA A156.19 Power Assist & Low Energy Power Operated Doors (2013)
 - 12. ANSI/BHMA A156.21 Thresholds (2014)
 - 13. ANSI/BHMA A156.22 Door Gasketing Systems (2012)
 - 14. ANSI/BHMA A156.25 Electrified Locks (2013)
 - 15. ANSI/BHMA A156.26 Continuous Hinges (2012)
 - 16. ANSI/BHMA A156.28 Keying Systems (2013)
 - 17. ANSI/BHMA A156.31 Electric Strikes (2013)
 - 18. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames (2014)
 - 19. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames (2016)
- B. International Code Council/American National Standards Institute (ICC/ANSI)/ADA:

1. ICC/ANSI A117.1 Standards for Accessible and Usable Buildings and Facilities

C. Underwriters Laboratories, Inc. (UL):

1. UL 10C Positive Pressure Fire Test of Door Assemblies.
2. UL 1784 Air Leakage Test of Door Assemblies.
3. UL 294 Access Control System Units

D. Door and Hardware Institute (DHI):

1. DHI Publications – Keying Systems and Nomenclature (1989).
2. DHI Publication – Abbreviations and Symbols.
3. DHI Publication – Installation Guide for Doors and Hardware.
4. DHI Publication – Sequence and Format of Hardware Schedule (1996).

E. National Fire Protection Agency (NFPA):

1. NFPA 70 National Electrical Code
2. NFPA 80 Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 Life Safety Code
4. NFPA 105 Standard for the Installation of Smoke Door Assemblies

1.03 SUBMITTALS

A. Submit in accordance with Conditions of the Contract and Division 1 Administrative Requirements and Submittal Procedures Section.

B. Shop Drawings:

1. Organize hardware schedule in vertical format as illustrated in DHI Publications Sequence and Formatting for the Hardware Schedule. Include abbreviations and symbols page according to DHI Publications Abbreviations and Symbols. Complete nomenclature of items required for each door opening as indicated.
2. Coordinate final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of hardware.
3. Architectural Hardware Consultant (AHC), as certified by DHI, who will affix seal attesting to completeness and correctness, including the review of the hardware schedule prior to submittal.

C. Submit manufacturer's catalog sheet on design, grade, and function of items listed in hardware schedule. Identify specific hardware item per sheet, provide an index, and cover sheet.

D. Templates:

1. Upon final approval of the architectural hardware schedules, submit one set of complete templates for each hardware item to the door manufacturers, frame manufacturers, and the installers. Date and index these 8-1/2 inch x 11 inch papers in a three ring binder, including detailed lists of the hardware location requirements for mortised and surface applied hardware within fourteen days of receiving approved door hardware submittals.

E. Electrified Hardware: Provide electrical information to include voltage and amperage requirements for electrified door hardware and description of operation.

1. Description of operation for each electrified opening to include description of component functions including location, sequence of operation and interface with other building control systems.

2. Wiring Diagrams: Detail wiring for power, signal, and control system and differentiate between manufacturers installed and field-installed wiring. Include the following:
 - a. System schematic.
 - b. Point to point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.
 3. Detail interface between electrified door hardware and fire alarm, access control, security, and building control systems.
 4. Provide junction boxes, relays and terminal blocks as needed for proper door operations and connections.
- F. Upon door hardware submittal approval, furnish for each electrified opening, three copies of point to point diagrams.
- G. Closeout Submittals: Submit to Owner in a three-ring binder or CD if requested.
1. Warranties.
 2. Maintenance and operating manual.
 3. Maintenance service agreement.
 4. Record documents.
 5. Copy of approved hardware schedule.
 6. Copy of approved keying schedule with bitting list.
 7. Door hardware supplier name, phone number, and fax number.

1.04 QUALITY ASSURANCE

- A. Listed and Labeled electrified door hardware as defined in NFPA 70, Article 100, by a testing agency acceptable to authority having jurisdiction.
- B. Hardware supplier will employ an Architectural Hardware Consultant (AHC) as certified by DHI and a member of the seal program who will be available at reasonable times during course of work for Project hardware consultation.
1. Electrified Door Hardware Supplier Qualifications: Experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Door hardware conforming to ICC/ANSI A117.1: Handles pulls, latches locks and operating devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
- D. Fire Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and/or labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C, unless otherwise indicated.
- E. Fire Door Inspection: Prior to receiving certificate of occupancy have fire rated doors inspected by an independent Certified Fire and Egress Door Assembly Inspector (FDAI), as certified by Intertek (ITS), a written report be submitted to Owner and Contractor. Doors failing inspection must be adjusted, replaced or modified to be within appropriate code requirements. (Use for a building under IBC 2009 or newer.)

- F. Smoke and Draft Control Door Assemblies: Where smoke and draft control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
- G. Door hardware certified to ANSI/BHMA standards as noted, participate and be listed in BHMA Certified Products Directory.
- H. Substitution request: create a comparison chart that includes the testing information as well as the warranty for both the specified product and the proposed substitution. Include the reason for requesting the substitution, clear catalog copy highlighting the proposed product and options, compliance statement, technical data, product warranty and lead time, to show how the proposed can meet or exceed established level of design, function, and quality. Approval of request is at the discretion of the owner, architect, and their designated consultants and will be addressed via addendum prior to bid date.
1. Items listed with no substitute manufacturers have been requested by the Owner to meet existing standard and will not be reviewed for substitution, unless the product is no longer available.
- I. Meetings: Comply with requirements in Division 1 Section "Project Meetings."
1. Low-voltage Coordination Meeting
 - a. Prior to furnishing door hardware submittals, convene a low-voltage coordination meeting. Participants required to attend: Contractor, installer, material supplier, manufacturer representatives, electrical contractor, security consultant, and fire alarm consultant.
 - b. Review sequence of operation for each opening with electrified hardware to ensure that every opening functions in the proper manner for the Owner's use.
 - c. Discuss the types of electrified door hardware, inspection, and electrical roughing-in and other preparatory work performed by other trades.
 - d. Verify wire quantities, wire types, wire sizes, conduit sizes, and locations including if the power supplies will be centrally located or if they will be located near each opening.
 - e. Coordinate the door hardware, power supplies, back-up power requirements, access control components, fire alarm interfaces, elevator controls, and related building systems have all proper and necessary components to interface and operate correctly.
 2. Keying Meeting
 - a. Within fourteen days of receipt of approved door hardware submittals, contact Owner with representative from hardware supplier to establish a keying conference. Verify keyway, visual key identification, number of master keys and keys per lock. Provide keying system per Owner's instructions.
 3. Pre-installation Meeting
 - a. Convene meeting within fourteen days of receipt of approved door hardware submittals. Participants required to attend: Contractor, installer, material supplier, manufacturer representatives, electrical contractor, security consultant, and fire alarm consultant.
 - b. Include in-conference decisions regarding proper installation methods and procedures for receiving and handling hardware.
 - c. Review all system, elevation, and point-to-point drawings to ensure that all necessary components are provided and detailed.
 - d. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
- J. Installer Qualifications: Specialized in performing installation of this Section and have five years minimum documented experience.

1. Electrified Door Hardware Supplier Qualifications: Experienced door hardware installer who has installed projects with electrified door hardware 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.

- K. Hardware listed in 3.07 – Hardware Schedule is intended to establish minimum level of design, type, function and grade of hardware to be used.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide clean, dry and secure room for hardware delivered to Project but not yet installed. Shelf hardware off of the floor and with larger items of hardware being stored on wooden pallets. Arrange locksets and keyed cylinders by opening number. Organize the balance of hardware by brand, model of hardware, and hardware set number. Leave the door markings of the hardware visible for installers.
- B. Furnish hardware that is not bulk packed with each unit marked and numbered in accordance with approved finish hardware schedule. Include architect's opening number, hardware set number, and item number for each type of hardware. Include keyset symbols and corresponding hardware component for keyed products.
- C. Pack each item complete with necessary parts and fasteners in manufacturer's original packaging.
- D. Deliver architectural hardware to the job site according to the phasing agreed upon in the pre-installation meeting. Inventory the delivery with the supplier's assistance. Immediately note shortages and damages on the shipping receipts and bill of lading. Coordinate replacement or repair with the supplier.
- E. Deliver permanent keys, cores, and related accessories directly to Owner via registered mail or overnight package service. Establish the instructions for delivery to Owner at "Keying Conference."
- F. Waste Management and Disposal: Separate waste materials for use or recycling in accordance with Division 1.

1.06 WARRANTY

- A. General Warranty: Owner may have under provisions of the Contract Documents and be an addition and run concurrently with other warranties made by Contractor under requirements of the Contract documents.
- B. Special Warranty: Warranties specified in this article will not deprive Owner of other rights.
 1. Ten years for manual door closers.
 2. Five years for mortise, auxiliary and bored locks.
 3. Five years for exit devices.
 4. One year for electromechanical door hardware.
- C. Replace or repair defective products during warranty period in accordance with manufacturer's warranty at no cost to Owner. There is no warranty against defects due to improper installation, abuse, and failure to exercise normal maintenance.

- D. Maintenance Tool and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, removal and replacement of door hardware.

PART 2 – PRODUCTS

2.01 HINGES

- A. Hinges, electric hinges, and self-closing hinges of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Standards: Products to be certified and listed by the following:
1. Butts and Hinges: ANSI/BHMA A156.1.
 2. Template Hinge Dimensions: ANSI/BHMA A156.7.
- C. Butt Hinges:
1. Hinge weight and size unless otherwise indicated in hardware sets:
 - a. Doors up to 36" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .134" and a minimum of 4-1/2" in height.
 - b. Doors from 36" wide up to 42" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .145" and a minimum of 4-1/2" in height.
 - c. For doors from 42" wide up to 48" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .180" and a minimum of 5" in height.
 - d. Doors greater than 1-3/4" thick provide hinges with a minimum thickness of .180" and a minimum of 5" in height.
 - e. Width of hinge is to be minimum required to clear surrounding trim.
 2. Base material unless otherwise indicated in hardware sets:
 - a. Exterior Doors: 304 Stainless Steel, Brass or Bronze material.
 - b. Interior Doors: Steel material.
 - c. Fire Rated Doors: Steel or 304 Stainless Steel materials.
 - d. Stainless Steel ball bearing hinges to have stainless steel ball bearings. Steel ball bearings are unacceptable.
 3. Quantity of hinges per door unless otherwise stated in hardware sets:
 - a. Doors up to 60" in height provide 2 hinges.
 - b. Doors 60" up to 90" in height provide 3 hinges.
 - c. Doors 90" up to 120" in height provide 4 hinges.
 - d. Doors over 120" in height add 1 additional hinge per each additional 30" in height.
 - e. Dutch doors provide 4 hinges.
 4. Hinge design and options unless otherwise indicated in hardware sets:
 - a. Hinges are to be of a square corner five-knuckle design, flat button tips and have ball bearings unless otherwise indicated in hardware sets.
 - b. Out-swinging exterior and out-swinging access controlled doors are required to have Non-Removable Pins (NRP) to prevent removal of pin while door is in closed position.
 - c. When full width of opening is required, use hinges that are designed to swing door completely from opening when door is opened to 95 degrees.
 - d. When shims are necessary to correct frame or door irregularities, provide metal shims only.
 5. Acceptable Manufacturers:

	Standard Weight	Heavy Weight
Hager	BB1279/BB1191	BB1168/BB1199

Bommer	BB5000/BB5002	BB5004/BB5006
McKinney	TA2714/TA2314	T4A3786/T4A3386

2.02 CONTINUOUS HINGES

- A. Continuous hinges of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Standards: Products to be certified and listed by ANSI/BHMA A156.26 Grade 1.
- C. Continuous Geared Hinges:
 - 1. Determine model number by door and frame application, door thickness, frequency of use, and fire rating requirements according to manufacturer's recommendations.
 - a. Size length of hinge to equal the actual door height unless otherwise stated in hardware sets.
- D. Material and Design:
 - 1. Base material: Anodized aluminum manufactured from 6063-T6 material, unexposed working metal surfaces be coated with TFE dry lubricant.
 - 2. Bearings:
 - a. Vertical loads be carried on Lubriloy RL bearings for non-fire rated doors.
 - b. Continuous hinges are to have a minimum spacing between bearings of 2-9/16". Typical door from 80" to 84" in height to have a minimum of 32 bearings.
 - 3. Options:
 - a. Provide Removable Electric Through-Wire (RETW) with appropriate number of wires to transfer power through door frame to door for proper connection of finish hardware. Provide RETW in a form that can be removed for connection, servicing without removing entire hinge from door and frame, and certified to handle an amperage rating of 3.5AMPS/continuous duty with 16.0AMPS/intermittent duty.
 - b. Provide factory-cut preparations for concealed electric power transfers.
 - c. When full width of opening is required, use hinges that are designed to swing door completely from opening when door is opened to 95 degrees.
 - d. At fire rated openings provide hinges that carry a UL certification, up to and including 90-minute applications for wood doors and up to 3-hour applications for metal doors.

E. Acceptable Manufacturers:

	Heavy Duty
Hager	780-112/780-112HD/780-224HD
Bommer	
Zero	

2.03 FLUSH BOLTS AND COORDINATORS

- A. Flush bolts of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Standards: Manufacturer to be listed by the following: Auxiliary Hardware: ANSI/BHMI A156.16.
- C. Labeled openings: Provide automatic or constant latching flush bolts per hardware schedule for inactive leaf of pairs of doors. Provide dust proof strikes for bottom bolt.
- D. Non-Labeled openings: Provide two flush bolts for inactive leaf of pairs of doors per hardware schedule. Provide extension rods so that the center line of the top flush bolt is not more than 78" above the finish floor. Provide dust proof strike from bottom bolt.

E. Acceptable Manufacturers:

	Manual Flush Bolt	Auto Flush Bolt	Dust Proof Strike
Hager	282D	292D/295W/296W	280X
Rockwood	555	1942	570
Trimco	3917	3815	3911

2.04 ELECTRIC STRIKES

A. Provide for use with type of locks shown on hardware schedule.

B. Products to be certified and listed by the following:

1. ANSI/BHMA A156.31 Electric Strikes and Frame Mounted Actuators Grade 1.
2. UL Tested 1500 lb. static strength.
3. UL listed for Fire Doors and Frames where applicable.
4. UL 1034 Burglary Resistance.
5. UL 10C.3H fire-rated, 4' x 8' door.

C. Material and Design:

1. To accept up to 3/4" latch bolt and 1" deadbolt.
2. Field reversible, Fail Safe or Fail Secure.
3. Dual voltage 12/24 VDC.
4. Tamper resistant, stainless steel corrosion resistance parts, and cast body and keeper.

D. Options:

1. Latch Bolt Monitoring (LBM) Signals the door is closed and latched or unlatched and open.
2. Door Secure Monitor (DSM) Door secure and unlocked monitoring.
3. Deadbolt Monitoring (DBM) Signals deadbolt projected or retracted.
4. Plug in buzzer (BUZZ) Indicates Fail Secure strike is energized and unlocked.
5. Rectified (RECT) Converts AC to DC.

E. Acceptable Manufacturers:

Hager	2930 Series
SDC	55 Series
RCI	

2.05 LOCKS AND LATCHES

A. Locks and latches of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Product to be certified and listed by following:

1. ANSI/BHMA A156.2 Series 4000 Certified to Grade 1.
2. ANSI/BHMA A250.13 Certified for a minimum design load of 1150 lbf (100 psf) for single out-swinging doors measuring 36" in width and 84" in height and a minimum design load of 1150lbf (70psf) for out-swinging single doors measuring 48" in width and 84" in height.
3. UL/cUL Labeled and listed for functions up to 3 hours for single doors up to 48" in width and up to 96" in height.
4. UL10C/UBC 7-2 Positive Pressure Rated.
5. ICC/ANSI A1117.1

- C. Lock and latch function numbers and descriptions of manufacturer's series as listed in hardware sets.
- D. Material and Design:
1. Lock and latch chassis to be zinc dichromate for corrosion resistance.
 2. Keyed functions to be of a freewheeling design to help resist against vandalism.
 3. Non-handed, field reversible.
 4. Thru-bolt mounting with no exposed screws.
 5. Levers, zinc cast and plated to match finished designation in hardware sets.
 6. Roses, wrought brass or stainless steel material.
- E. Latch and Strike:
1. Stainless Steel latch bolt with minimum of 1/2" throw and deadlocking for keyed and exterior functions. Provide 3/4" latch bolt for pairs of fire-rated doors where required by door manufacturer. Standard backset to be 2-3/4" and adjustable faceplate to accommodate a square edge door or a standard 1/8" beveled edge door.
 2. Strike is to fit a standard ANSI A115 prep measuring 1-1/4" x 4-7/8" with proper lip length to protect surrounding trim.
- F. Options:
1. Doors requiring lead line protection – provide locks with 1/16" lead applied to lock and 1/16" lead wrapped around latch bolt.
 2. Provide knurled levers on entry side of doors that are potentially dangerous to visually impaired persons.
- G. Electric Locks:
1. Fail-Safe (power locks lever) outside trim is locked when power is applied and unlocked when power is removed. Lockset will unlock in the event of a power failure (EL).
 2. Fail-Secure (power unlocks lever) outside trim is locked when there is no power and unlocked when power is applied. Lockset will be locked in the event of a power failure (EU).

H. Acceptable manufacturers:

Schlage	ND Series
Hager	3400 Series
Best	9K Series

2.06 LOCKS AND LATCHES (UNI-SEX TOILETS)

- A. Locks and latches of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Standards: Product to be certified and listed by following:
1. ANSI/BHMA A156.13 Series 1000 Certified to Grade 1 for Operational and Security.
 2. UL/cUL Labeled and listed up to 3 hours for single doors up to 48" in width and up to 96" in height.
 3. UL10C/UBC 7-2 Positive Pressure Rated.
 4. ICC/ANSI A117.1.
- C. Lock and latch function numbers and descriptions of manufacturer's series as listed in hardware sets.
- D. Material and Design:
1. Lock cases from fully wrapped, 12 gauge steel, zinc dichromate for corrosion resistance.

2. Non-handed, field reversible without opening lock case.
3. Break-away spindles to prevent unlocking during forced entry or vandalism.
4. Levers, zinc cast, forged brass or stainless steel and plated to match finish designation in hardware sets.
5. Sectional Roses, solid brass or stainless steel material and have a minimum diameter of 2-7/16".
6. Armor fronts, self-adjusting to accommodate a square edge door or a standard 1/8" beveled edge door.

E. Latch and Strike:

1. Stainless steel latch bolt with minimum of 3/4" throw and deadlocking for keyed and exterior functions.
2. Strike is to fit a standard ANSI A115 prep measuring 1-1/4" x 4-7/8" with proper lip length to protect surrounding trim.
3. Deadbolts to be 1-3/4" total length with a minimum of a 1" throw and 3/4" internal engagement when fully extended and made of stainless steel material.

F. Acceptable Manufacturers:

Schlage	L9000 Series
Hager	3800 Series
Best	45 Series

2.07 MORTISE DEADBOLTS

A. Mortise deadbolts of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be certified by the following:

1. ANSI/BHMA A156.13 Series 2000 Grade 1 Operational and Security.
2. UL/cUL listed for functions up to 3 hours for "A" label.
3. UL10C/UBC 7-2 Positive Pressure Rated.
4. ADA – Thumb turn.

C. Deadbolt function numbers and descriptions of manufacturer's series as listed in hardware sets.

D. Material and Design:

1. Latch bolt projection 1" throw.
2. Case steel, zinc dichromate.
3. Armor front 5-9/16". Case dimension 4-5/16" x 3-9/16" x 1".

E. Acceptable Manufacturers:

Schlage	L400 Series
Hager	3800 Series
Best	45 Series

2.08 DEADBOLT FOR ALUMINUM STILE DOORS

A. Deadbolts for aluminum doors of one manufacturer as listed for continuity of design and consideration of warranty. At Pairs of doors incorporate a threshold and header bolt. Turning key 360 degrees will retract or throw deadbolt for single doors and retract or throw threshold and header bolt for pairs of doors.

B. Standards: Auxiliary Locks and Associated Products: ANSI/BHMA Certified A156.5 Grade 1.

C. Material and Design:

1. Lock chassis: Zinc dichromate for corrosion resistance.
2. Armored faceplate 1" x 6" and to match aluminum door edge.

D. Latches and Strike:

1. Deadbolt 1-3/8" throw eight ply laminated stainless steel. Center ply alumina-ceramic core to defeat hacksaw attack.

E. Acceptable Manufacturers:

Adams Rite	MS1850S Series
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2.09 ALUMINUM DOOR DEADLATCHES

A. Deadlatches for aluminum doors of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Auxiliary Locks and Associated Products: ANSI/BHMA Certified A156.5 Grade 1.

C. Material and Design:

1. Cylinder Backset: 31/32", 1-1/8", or 1-1/2".
2. Case: Measures 7/8" x 5-13/16" x depth. Depth varies by backset. Steel with corrosion-resistant plating. Screw-fastened tube spacer brackets allow for cleaner removal when tab mounting.
3. Faceplates: Measures 1" x 6-7/8". Both flat and radius faceplates are supplied. Flat faceplates can also be adjusted in the field for right or left beveled edge doors.

D. Latches and Strike:

1. Latchbolt: 5/8" x 1" x 5/8" throw. Solid brass. Handing is easily reversible using only a screwdriver.
2. Auxiliary Latchpin: Stainless steel. Deadlocks latchbolt to prevent "loiding" or case-knife entry.
3. Strikes: Standard strike furnished is 4902 for flat jamb where door closes flush or nearly flush.

E. Cylinder Cam:

1. 4900 Heavy-Duty Deadlatches are operable by any standard 1-5/32" diameter mortise cylinder with Adams Rite-type cam.

F. Options:

1. Bolt Holdback: While bolt is held fully retracted, a reverse turn of the key retains the bolt, allowing the door to be free swinging.

G. Acceptable Manufacturers:

Adams Rite	4900
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2.10 ALUMINUM DOOR DEADLATCH PADDLES

A. Deadlatch paddles for aluminum doors of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Auxiliary Locks and Associated Products: ANSI/BHMA Certified A156.5 Grade 1.

C. Material and Design:

1. Paddle: Extruded aluminum, 628 Clear Anodized finished (US28).
2. Escutcheon: 1-3/8" x 4". Zinc alloy with black finish. Houses steel operating mechanism. Secured to door stile with special binder posts that extend into the escutcheon to rigidly resist torque loads in any direction. A 1/4" square heat-treated spindle is part of escutcheon assembly, which interlocks with the cam plug.
3. Cam Plug: Furnished for use with 4900 Series Deadlatches. Secured in latch body by cylinder set screw, plug is also rigidly tied to escutcheon by hardened steel pins. Handing can be reversed by removing a spring clip, reversing the cam, and replacing the clip.

D. Acceptable Manufacturers:

Adams Rite	4590
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2.11 EXIT DEVICES

- A. Exit Devices of one manufacturer as listed for continuity of design and consideration of warranty. Touchpad type, finish to match balance of door hardware.

B. Standards: Manufacturer to be certified and/or listed by the following:

1. BHMA Certified ANSI A156.3 Grade 1.
2. UL/cUL Listed for up to 3 hours for "A" labeled doors.
3. UL10C/UBC 7-2 Positive Pressure Rated.
4. UL10B Neutral Pressure Rated.
5. UL 305 Listed for Panic Hardware.

C. Material and Design:

1. Provide exit devices with actuators that extend a minimum of one-half of door width.
2. Where trim is indicated in hardware sets provide the lever design to match design of lock levers.
3. Exit device to mount flush with door.
4. Latchbolts:
 - a. Rim device – 3/4" throw, Pullman type with automatic dead-latching, stainless steel
 - b. Surface vertical rod device – Top 1/2" throw, Pullman type with automatic dead-latching, stainless steel. Bottom 1/2" throw, Pullman type, held retracted during door swing, stainless steel.
5. Fasteners: Wood screws, machine screws, and thru-bolts.

- D. Lock and Latch Functions: Function numbers and descriptions of manufacturer's series and lever styles indicated in door hardware sets.

E. Electric Modifications:

1. Motorized Latch Retraction (MLR): An electric motor retracts the latch bolt for momentary or maintained periods of time.
2. Electrified Trim: Outside trim locked (EL) or unlocked (EU) by electric current.

F. Acceptable Manufactures:

Hager	4500 Series	
Von Duprin	99 Series	
Sargent	80 Series	

2.12 CYLINDERS AND KEYING

- A. Cylinders of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Products to be certified and listed by the following:
1. Auxiliary Locks: ANSI/BHMA A156.5
- C. Cylinders:
1. Provide cylinders matched to the types required for hardware that has a locking function and for keyed electronic functions. Furnish with appropriate collars, cams, and tailpieces to fit and operate associated hardware. Stacking collars is not acceptable, a single collar of proper size is required.
 2. Schlage "GB" keying
 3. Provide concealed key control (CKC) at cylinder by stamping or permanently marking the keyset symbol in a location on the cylinder that is concealed when installed.
- D. Keying:
1. Key into Owner's existing key system.
 2. Provide a bitting list to Owner of combinations as established, and expand to twenty-five percent for future use or as directed by Owner.
 - a. Include all of the keysets and bittings of the original key system creating one clean version of the entire key system.
 3. Keys to be shipped directly to the Owner's Representative as established during the keying conference.
 - a. Package the keys in individual envelopes, grouped by keyset symbol, and label envelopes with project name, factory registry number, and keyset symbol.
 4. Stamp large bow key blanks with visual key control (keyset symbol) and "Do Not Duplicate".
 5. Provide interchangeable cores with construction cores as required per the keying meeting.
- E. Acceptable Manufacturers:

Schlage
Hager
Best

2.13 PUSH/PULL PLATES AND BARS

- A. Push/Pull plates and bars of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Standards: Manufacturer to be certified by the following:
1. Architectural Door Trim: ANSI/BHMA A156.6.
 2. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- C. Push plates: .050" thick, square corner and beveled edges with countersunk screw holes. Width and height as stated in hardware sets.
- D. Acceptable Manufacturers:

Hager	30S
Rockwood	
Trimco	

E. Pull Plates: .050" thick, square corner and beveled edges. Width and height as stated in hardware sets, 3/4" diameter pull, with clearance of 2-1/2" from face of door.

F. Acceptable Manufacturers:

Hager	H 33J
Rockwood	
Trimco	

G. Pull Bar Sets: 1" round bar stock with 2 –1/2" clearances from face of door.

H. Acceptable Manufacturers:

Hager	H 12J/H 22J
Rockwood	
Trimco	

2.14 CLOSERS

A. Closers of one manufacturer as listed for continuity of design and consideration of warranty, unless otherwise indicated on hardware schedule, comply with manufacturer's recommendations for size of closer, depending on width of door, frequency of use, atmospheric pressure, ADAAG requirement, and fire rating.

B. Standards: Manufacturer to be certified and or listed by the following:

1. BHMA Certified ANSI A156.4 Grade 1.
2. ADA Complaint ANSI A117.1.
3. UL/cUL Listed up to 3 hours.
4. UL10C Positive Pressure Rated.
5. UL10B Neutral Pressure Rated.

C. Material and Design:

1. Provide cast iron non-handed bodies with full plastic covers.
2. Closers will have separated staked adjustable valve screws for latch speed, sweep speed, and backcheck.
3. Provide Tri-Pack arms and brackets for regular arm, top jamb, and parallel arm mounting.
4. One-piece seamless steel spring tube sealed in hydraulic fluid.
5. Double heat-treated steel tempered springs.
6. Precision-machined heat-treated steel piston.
7. Triple heat-treated steel spindle.
8. Full rack and pinion operation.

D. Mounting:

1. Out-swing doors use surface parallel arm mount closers except where noted on hardware schedule.
2. In-swing doors use surface regular arm mount closers except where noted on hardware schedule.
3. Provide brackets and shoe supports for aluminum doors and frames to mount fifth screw.
4. Furnish drop plates where top rail conditions on door do not allow for mounting of closer and where backside of closer is exposed through glass.

E. Size closers in compliance with requirements for accessibility (ADAAG). Comply with following maximum opening force requirements.

1. Interior hinged openings: 5.0 lbs.
2. Fire-rated and exterior openings use minimum opening force allowable by authority having jurisdiction.

F. Fasteners: Provide self-reaming, self-tapping wood and machine screws, and sex nuts and bolts for each closer.

G. Acceptable manufacturers:

Hager	5100 Series
LCN	4040XP Series
Sargent	281 Series

2.15 LOW ENERGY POWER OPERATORS

A. Low energy power operators of one manufacturer as listed for continuity of design and consideration of warranty.

B. Products to be certified and listed by the following:

1. Power Assist and Low Energy Power Operated Doors: ANSI/BHMA A156.19.
2. ADA Complaint ANSI A117.1.

C. Materials and Design:

1. Self-contained electrical control unit, including necessary transformers, relays, rectifiers, and other electronic components for proper operation, switching and control of door up to 350 lbs. and also include time delay for normal cycle.
2. On pairs of doors, either door to be opened manually without the other door opening.
3. Operates as a mechanical closer if power is disconnected. Forces consistent with ANSI A117.1 and ANSI A156.19.
4. Provide delay switches for motor activation, exit device latch retraction interfacing and hold open times. Hold open times to be adjustable from 1 second to continuous seconds.
5. Adjustable vestibule sequencing input for operation of two or more units. Specify 2-659-0240.
6. Adjustable powered swing degree from 80 degrees to 110 degrees.
7. Integral obstruction detection for closing and opening cycle.
8. Adjustable built-in stop, set from 80 degrees maximum to 180 degrees manual swing.
9. When in "blow open" operation for smoke ventilation, operator will stay in the open position when loss of power.
10. Boost to close selectable on/off switch.

D. Signage: Provide signage in according to the requirements of ANSI/BHMA A156.19.

E. Acceptable Manufacturers:

Hager	8300 Series
LCN	4640 Series
Norton	6000 Series

F. Actuators:

1. Opening cycle activated by pressing switches with international symbol of accessibility and "PUSH TO OPEN" engraved on faceplate.
2. Switches installed in standard 2-gang electrical wall box and placed in a location in compliance with ANSI A117.1.

3. Wireless actuators optional.
4. Provide bollards as required where a suitable wall mount is not possible.

G. Acceptable Manufacturers:

Hager
MS Sedco
SDC

2.16 PROTECTIVE TRIM

- A. Protective trim of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Size of protection plate: single doors, size two inches less door width (LDW) on push side of door, and one inch less door width on pull side of door. For pairs of doors, size one inch less door width (LDW) on push side of door, and 1/2 inch on pull side of door. Adjust sizes to accommodate accompanying hardware, such as, edge guards, astragals and others.
 1. Kick Plates 8" high or sized to door bottom rail height.
 2. Mop Plates 4" high.
- C. Products to be certified and listed by the following:
 1. Architectural Door Trim: ANSI/BHMA A156.6.
 2. UL.
- D. Material and Design:
 1. 0.050" gage stainless steel.
 2. Corners square, polishing lines or dominant direction of surface pattern so they run across door width of plate.
 3. Bevel top, bottom, and sides uniformly leaving no sharp edges.
 4. Countersink holes for screws. Space screw holes so they are no more than eight inches CTC, along a centerline not over 1/2" in from edge around plate. End screws maximum of 0.53" from corners.
- E. UL label stamp required on protection plates when top of plate is more than 16 inches above bottom of door on fire rated openings. Verify door manufacturer's UL listing for maximum height and width of protection plate to be used.

F. Acceptable Manufacturers:

Hager	190S
Trimco	
Burns	

2.17 STOPS AND HOLDERS

- A. Stops and holders of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Wall Stops: Provide door stops wherever necessary to prevent door or hardware from striking an adjacent partition or obstruction. Provide wall stops when possible. Door stops and holders mounted in concrete floor or masonry walls have stainless steel machine screws and lead expansion shields.
- C. Products to be certified and listed by the following:

1. Auxiliary Hardware: ANSI/BHMA A156.16.

D. Acceptable Manufacturers:

	Convex	Concave
Hager	232W	236W
Rockwood		
Burns		

- E. Overhead Stops and Holders: Provide overhead stops and holders for doors that open against equipment, casework sidelights and other objects that would make wall stops/holders and floor stops/holders inappropriate. Provide sex bolt attachments for mineral core wood door applications.
- F. Products to be certified and listed by the following:
1. Overhead Stops and Holders: ANSI/BHMA A156.8 Grade 1.

G. Acceptable Manufacturers:

	Heavy Duty Surface	Heavy Duty Concealed
Hager	7000 SRF Series	7000 CON Series
Glynn Johnson	90 SRF Series	100 Series
Sargent	590 Series	690 Series

2.18 ELECTROMAGNETIC HOLDERS

- A. Electromagnetic holders of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Products to be certified and listed by the following:
1. ANSI A156.15 Grade 1.
 2. UL/ULC Listed.
 3. California State Fire Marshall listed (CSFM).
 4. City of New York MEA approved.
- C. Material and Design:
1. Provide electromagnetic holders where self-closing fire doors and smoke barrier doors are required to be held open. Electromagnetic holders to be fail-safe: when electrical current is interrupted, doors release to close automatically. Holding force 25-40 lbs.

D. Acceptable Manufacturers:

Hager	380 Series
LCN	
Rixson	

2.19 KEY SWITCHES

- A. Key switches of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Material and Design:
1. Single gang, wall mounted, recessed mortise cylinder.
 2. Tamper-resistant spanner screws.
 3. 20 gauge stainless steel faceplate.

C. Functions:

1. Momentary (MO).
2. Timed actuation (1-60 seconds).
3. Alternate action (on/off) (AA).

D. Options:

1. Anti-tamper switch (ATS).
2. One (1) green Led (LEDG).
3. One (1) red LED (LEDR).
4. One (1) green LED and one (1) red LED (2.LED).

E. Acceptable Manufacturers:

	(AA) SPDT	(MO) SPDT	(AA) DPDT	(MO) DPDT
Hager	29KS ASD	29KS MSD	29KS ADD	29KS MDD
SDC	701	702	705	706
RCI				

2.20 MODULAR ACCESS CONTROL POWER SUPPLIES

A. Power supplies of one manufacturer as listed for continuity of design and consideration of warranty.

B. Products to be certified and listed by the following:

1. UL Listed.

C. Design:

1. Use with modular access control systems.
2. Field selectable filtered and regulated 12 VDC or 24 VDC constant voltage.
3. 1, 2, 4, and 6 AMP load capacities. Match the power supply amperage to the total load of the opening /system plus an additional thirty percent to cover line drop, as well as possible expansion.
4. Circuit breaker protected AC input voltage secondary output PTC protected.
5. Fire alarm input provides simultaneous release of fail-safe locks and holders.
6. Interface relay.
7. LED status indicators provide information regarding AC input, DC output, and battery backup status.
8. Separate inputs for activation switch on entry and egress and ingress side of opening.
9. 5 amp hour battery backup.
10. Input 115 VAC (230 VAC optional).
11. Optional dual 12 VDC or 24 VDC output.
12. Optional power supply monitor module to monitor power supply status, A/C power, and D/C output and battery Status

D. Include optional modules as required to properly interface, control, and sequence the hardware with the access control system.

E. Acceptable Manufacturer:

Hager	2908	1 Amp
	2909	2 Amp
	2910	4 Amp
	2911	6 Amp

2.21 THRESHOLDS

- A. Thresholds of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Set thresholds for exterior and acoustical openings in full bed of sealant with lead expansion shields and stainless steel machine screws complying with requirements specified in Division 7 Section "Joint Sealants: Notched in field to fit frame by hardware installer. Refer to Drawings for special details.
- C. Standards: Manufacturer to be certified by the following:
 - 1. Thresholds: ANSI/BHMA A156.21.
 - 2. American with Disabilities Act Accessibility Guidelines (ADAAG).

D. Acceptable Manufacturers:

Hager	413S/520S
K.N. Crowder	
Reese	

2.22 DOOR GASKETING AND WEATHERSTRIP

- A. Door gasketing and weatherstrip of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing where indicated on hardware schedule. Provide noncorrosive fasteners for exterior applications.
 - 1. Perimeter gasketing: Apply to head and jamb, forming seal between door and frame.
 - 2. Meeting stile gasketing: Fasten to meeting stiles, forming seal when doors are in closed position.
 - 3. Door bottoms: Apply to bottom of door, forming seal with threshold or floor when door is in closed position.
 - 4. Sound Gasketing: Cutting or notching for stop mounted hardware not permitted.
 - 5. Drip Guard: Apply to exterior face of frame header. Lip length to extend 4" beyond width of door.
- C. Products to be certified and listed by the following:
 - 1. Door Gasketing and Edge Seal Systems: ANSI/BHMA A156.22.
 - 2. BHMA certified for door sweeps, automatic door bottoms, and adhesive applied gasketing.
- D. Smoke-Labeled Gasketing: Comply with NFPA 105 listed, labeled, and acceptable to Authorities Having Jurisdiction, for smoke control indicated.
 - 1. Provide smoke-labeled gasketing on 20 minute rated doors and on smoke rated doors.
- E. Fire-Rated Gasketing: Comply with NFPA 80 listed, labeled, and acceptable to Authorities Having Jurisdiction, for fire ratings indicated.
- F. Refer to Section 08 1416 Wood Doors for Category A or Category B. Comply with UBC 7-2 and UL10C positive pressure where frame applied intumescent seals are required.

G. Acceptable Manufacturers:

1. Perimeter Gasketing:

	Stop Applied	Adhesive Applied
Hager	881S	726
K.N. Crowder		
Reese		

2. Meeting Stile Weatherstrip:

Hager	802SB
K.N. Crowder	
Reese	

3. Door Bottom Sweeps:

Hager	750S
K.N. Crowder	
Reese	

4. Overhead Drip Guard

Hager	810S
K.N. Crowder	
Reese	

2.23 LATCH PROTECTORS

A. Latch protectors of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Manufacturer to be listed by the following: Auxiliary Hardware: ANSI/BHMA A156.16.

C. Design:

1. 12 ga. steel, stainless steel material.
2. Size: 3" x 11".
3. Non-handed.
4. Frame pin prevents prying of door.
5. Use with 1-3/4" thick door.
6. Use with cylindrical locksets with a 2-3/4" backset at exterior outswinging doors.
7. Fasteners: Two 5/16-18 x 1-1/2" carriage bolts with sex nuts.

D. Acceptable Manufacturers:

	Cylindrical	
Hager	341D	
Rockwood		
Trimco		

2.24 SILENCERS

A. Where smoke, light, or weather seal are not required, provide three silencers per single door frame, two per double door frame and four per Dutch door frame.

B. Products to be certified and listed by the following:

1. Auxiliary Hardware: ANSI/BHMA A156.16

C. Acceptable Manufacturers:

	Hollow Metal Frame	Wood Frame
Hager	307D	308D
Rockwood		
Trimco		

2.25 KEY CABINET

A. Provide key cabinet; surface mounted to wall.

B. Key control system:

1. Include two sets of key tags, hooks, labels, and envelopes.
2. Contain system in metal cabinet with baked enamel finish.
3. Capacity will be able to hold actual quantities of keys, plus 50 percent.
4. Provide tools, instruction sheets, and accessories required to complete installation.

C. Acceptable Manufacturers:

Lund Equipment
Telkee Incorporated
Key Control

2.26 FINISHES

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if within 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 range of approved samples.
- B. Comply with base material and finish requirements indicated by ANSI/BHMA A156.18 designations in hardware schedule.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine doors and frames, with Installers present, for compliance with requirements for installation tolerances, labeled fire-rated 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. Notify Architect via a prepared written report and endorsed by Installer of any discrepancies between the door schedule, door types, drawings and scheduled hardware. Report will have a list of conditions detrimental to application, to the proper and timely completion of the work and performance of the hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.02 INSTALLATION

- A. Install hardware using manufactures recommended fasteners and installation instructions, at height locations and clearance tolerances that comply with:
 - 1. NFPA 80
 - 2. NFPA 105
 - 3. ICC/ANSI A117.1
 - 4. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames
 - 5. ANSI/BHMA A156.115W hardware Preparation in Wood Doors with Wood or Steel Frames
 - 6. DHI Publication – Installation Guide for Doors and Hardware
 - 7. Approved shop drawings
 - 8. Approved finish hardware schedule
- B. Install soffit mounted gaskets prior other soffit mounted hardware to provide a continuous seal around the perimeter of the opening without cutting or notching.
- C. Install door closers so they are on the interior of the room side of the door. Stairwell doors will have closers mounted on the stair side and exterior doors will be mounted on the interior side of the building.
- D. In drywall applications provide blocking material of sufficient type and size for hardware items that mount directly to the wall.
- E. Locate wall mounted bumper to contact the trim of the operating trim.
- F. Mount mop and kick plates flush with the bottom of the door and centered horizontally on the door.
- G. Set thresholds for exterior, and acoustical doors at sound control openings in full bed of sealant complying with requirements specified in Division 07 Section “Joint Sealants” forming a tight seal between threshold and surface to which set.
- H. Anchor all components firmly into position and use anchoring devices furnished with the hardware item, unless otherwise specified.
- I. Do not install surface mounted items until finishes have been completed on substrates involved. Set unit level, plumb and true to line location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- J. Power Supplies: locate power supplies as indicated and verified in the low-voltage coordination meeting.

3.03 FIELD QUALITY CONTROL

- A. Material supplier to schedule final walk through to inspect hardware installation ten (10) business days before final acceptance of Owner. Material supplier will provide a written report detailing discrepancies of each opening to General Contractor within seven (7) calendar days of walk through.

3.04 ADJUSTMENT, CLEANING, AND DEMONSTRATING

- A. Adjustment: Adjust and check each opening to ensure proper operation of each item of finish hardware. Replace items that cannot be adjusted to operate freely and smoothly or as intended for application at no cost to Owner.

- B. Cleaning: Clean adjacent surfaces soiled by hardware installation. Clean finish hardware per manufacturer's instructions after final adjustments have been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no cost to Owner.
- C. Conduct a training class for building maintenance personnel demonstrating the adjustment, operation of mechanical and electrical hardware. Special tools for finish hardware to be turned over and explained usage at the meeting. Record all training and provide to the Owner for future reference.

3.05 PROTECTION

- A. Leave manufacturer's protective film intact and provide proper protection for all other finish hardware items that do not have protective material from the manufacture until Owner accepts project as complete.

3.06 HARDWARE SET SCHEDULE

- A. Intent of Hardware Groups
 - 1. Should items of hardware not specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
 - 2. Where items of hardware aren't correctly specified and are required for completion of the Work, a written statement of such omission, error, or other discrepancy is required to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.
- B. Guide: Door hardware items have been placed in sets which are intended to be a guide of design, grade, quality, function, operation, performance, exposure, and like characteristics of door hardware, and may not be complete. Provide door hardware required to make each set complete and operational.
- C. Hardware schedule does not reflect handing, backset, method of fastening, and like characteristics of door hardware and door operation.
- D. Review door hardware sets with door types, frames, sizes and details on drawings. Verify suitability and adaptability of items specified in relation to details and surrounding conditions.

3.07 HARDWARE SCHEDULE

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HARDWARE SET # 1

Door: 201A

2 Continuous Hinge	780-112HD x LAR	CLR	HA
2 Exit Device	4501 CVR CD	US32D	HA
1 Rim Cylinder	80-329	626	SC
3 Mortise Cylinder	80-302	626	SC
2 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Power Operator Set	8319 PUSH	ALM	HA
2 Actuator	2-659-0178	US32D	HA

1 Threshold	413S x LAR	MIL	HA
2 Door Sweep	750S N x LAR	CLR	HA
1 Key Switch	29KS ADD RED/GREEN LED'S	US32D	HA
Weatherstrip	By Aluminum Door / Frame Supplier		

NOTE: Exit Devices must be "dogged" for operator to work correctly.

HARDWARE SET # 2

Door: 209A

1 Thru Wire Continuous Hinge		780-224HD x LAR x	
RETWCLR	HA		
1 Electrified Lockset	ND80GD EU RHO	626	SC
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Threshold	520S N x LAR	MIL	HA
1 Set Weatherstrip	881S N x LAR	MIL	HA
1 Drip Cap	810S x LAR	MIL	HA
1 Power Supply	12/24 VDC AND AMP AS REQUIRED		BYOT
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, unlocks lever, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 3

Doors: 214A, 216C

1 Thru Wire Continuous Hinge		780-112HD x LAR x	
RETWCLR	HA		
1 Continuous Hinge	780-112HD x LAR	CLR	HA
2 Flush Bolt	282D	US26D	HA
1 Dust Proof Strike	280X	US26D	HA
1 Electrified Deadlatch	4300	628	AD
1 Mortise Cylinder	80-302	626	SC
1 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Deadlatch Paddle	4590 SERIES	628	AD
2 Closer	5100 x HDCS	ALM	HA
1 Threshold	413S x LAR	MIL	HA
2 Door Sweep	750S N x LAR	CLR	HA
1 Power Supply	12/24 VDC AND AMP AS REQUIRED		BYOT
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, retracts latch, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 4

Doors: 217A, 217B

2 Continuous Hinge	780-112HD x LAR	CLR	HA
2 Exit Device	4501 CVR CD	US32D	HA
1 Rim Cylinder	80-329	626	SC
2 Mortise Cylinder	80-302	626	SC
2 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
2 Closer	5100 x HDCS	ALM	HA
1 Threshold	413S x LAR	MIL	HA
2 Door Sweep	750S N x LAR	CLR	HA
Weatherstrip	By Aluminum Door / Frame Supplier		

HARDWARE SET # 5

This set not used.

HARDWARE SET # 6

Door: 219A

1 Continuous Hinge	780-224HD x LAR	CLR	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Latch Guard	341D	US32D	HA
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Threshold	520S N x LAR	MIL	HA
1 Set Weatherstrip	881S N x LAR	MIL	HA
1 Drip Cap	810S x LAR	MIL	HA

HARDWARE SET # 7

Door: 220A

1 Thru Wire Continuous Hinge	780-224HD x LAR	CLR	HA
HA			
1 Continuous Hinge	780-224HD x LAR	CLR	HA
2 Flush Bolt	282D 24" TOP ROD	US26D	HA
1 Dust Proof Strike	280X	US26D	HA
1 Electrified Lockset	ND80GD EU RHO	626	SC
1 Latch Guard	341D	US32D	HA
2 Closer	5100 x HDCS	ALM	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Threshold	520S N x LAR	MIL	HA
1 Set Weatherstrip	881S N x LAR	MIL	HA
1 Drip Cap	810S x LAR	MIL	HA
1 Power Supply	12/24 VDC AND AMP AS REQUIRED		BYOT

1 Access Control	ACCESS CONTROL READER (BY OTHERS)	BYOT
1 Wiring Diagram	RISER/POINT TO POINT	BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, unlocks lever, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 8

Door: 221A

2 Continuous Hinge	780-224HD x LAR	CLR	HA
2 Flush Bolt	282D 24" TOP ROD	US26D	HA
1 Dust Proof Strike	280X	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Latch Guard	341D	US32D	HA
2 Closer	5100 x HDCS	ALM	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Threshold	520S N x LAR	MIL	HA
1 Set Weatherstrip	881S N x LAR	MIL	HA
1 Drip Cap	810S x LAR	MIL	HA

HARDWARE SET # 9

Door: 200A

4 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Privacy Set w/Indicator	L9040 06A L283-722	626	SC
1 Closer	5100	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Mop Plate	190S x 4" x 1" LDW	US32D	HA
1 Wall Stop	236W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 10

Door: 201B

4 Hinge	BB1168 4 1/2 X 4 1/2 NRP	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Electric Strike	2930 CYL	US32D	HA
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
3 Door Silencer	307D	GREY	HA
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, releases strike, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 11

Doors: 202A, 203A, 203B

4 Hinge	BB1168 4 1/2 X 4 1/2 NRP	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Electric Strike	2930 CYL	US32D	HA
1 Closer	5100	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA
1 Power Supply	12/24 VDC AND AMP AS REQUIRED		BYOT
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, releases strike, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 12

Door: 215A

4 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 13

Doors: 204A, 205A, 206A, 207A, 208A

1 Continuous Hinge	780-112 x LAR	CLR	HA
1 Office Lock	ND50GD RHO	626	SC
1 Wall Stop	236W	US32D	HA
Weatherstrip	By Aluminum Door / Frame Supplier		

HARDWARE SET # 14

Doors: 210A, 210B

1 Continuous Hinge	780-112 x LAR	CLR	HA
1 Set Door Pulls	H 22J	US32D	HA
1 Overhead Stop	7016 CON	US32D	HA
Weatherstrip	By Aluminum Door / Frame Supplier		

HARDWARE SET # 15

Door: 211A

4 Hinge	BB1279 4 1/2 x 4 1/2 NRP	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Closer	5100	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 16

Doors: 212A, 213A

4 Hinge	BB1168 4 1/2 X 4 1/2	US26D	HA
1 Push Plate	30S 6 X 16	US32D	HA
1 Door Pull	H 33J 4 X 16	US32D	HA
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 17

Door: 214B

2 Continuous Hinge	780-112HD x LAR	CLR	HA
2 Flush Bolt	BY ALUMINUM DOOR MFG	US26D	BO
1 Dust Proof Strike	280X	US26D	HA
1 Deadlock	MS1850S	628	AD
2 Mortise Cylinder	80-302	626	SC
2 Set Door Pulls	H 22J	US32D	HA
2 Closer	5100 x HDCS	ALM	HA
Weatherstrip	By Aluminum Door / Frame Supplier		

HARDWARE SET # 18

Door: 216A

4 Hinge	BB1168 4 1/2 X 4 1/2	US26D	HA
1 Passage Set	ND10S RHO	626	SC
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 19

Door: 216B

4 Hinge	BB1168 4 1/2 X 4 1/2	US26D	HA
1 Passage Set	ND10S RHO	626	SC
1 Closer	5100	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Mop Plate	190S x 4" x 1" LDW	US32D	HA

1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 20

Doors: 216D, 218A, 218B, 222A

8 Hinge	BB1279 4 1/2 x 4 1/2 NRP	US26D	HA
2 Flush Bolt	282D 24" TOP ROD	US26D	HA
1 Dust Proof Strike	280X	US26D	HA
1 Office Lock	ND50GD RHO	626	SC
2 Overhead Stop	7016 SRF	US32D	HA
2 Door Silencer	307D	GREY	HA
1 Astragal	ASTRAGAL BY DOOR MANUFACTURER		BYOT

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HARDWARE SET # 101

Doors: 100A, 148B

2 Continuous Hinge	780-112HD x LAR	CLR	HA
2 Exit Device	4501 CVR CD	US32D	HA
2 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Rim Cylinder	80-329	626	SC
2 Mortise Cylinder	80-302	626	SC
2 Closer	5100 x HDCS	ALM	HA
1 Threshold	413S x LAR	MIL	HA
2 Door Sweep	750S N x LAR	CLR	HA
Weatherstrip	By Aluminum Door / Frame Supplier		

HARDWARE SET # 102

Door: 100B

1 Continuous Hinge	780-112HD x LAR	CLR	HA
1 Exit Device	4501 RIM CD	US32D	HA
1 Rim Cylinder	80-329	626	SC
1 Mortise Cylinder	80-302	626	SC
1 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Closer	5100 x HDCS	ALM	HA
1 Threshold	413S x LAR	MIL	HA
1 Door Sweep	750S N x LAR	CLR	HA
Weatherstrip	By Aluminum Door / Frame Supplier		

HARDWARE SET # 103

Door: 108A

1 Thru Wire Continuous Hinge	780-112HD x LAR x		
RETWCLR	HA		
1 Continuous Hinge	780-112HD x LAR	CLR	HA
2 Flush Bolt	282D	US26D	HA
1 Dust Proof Strike	280X	US26D	HA
1 Electrified Deadlatch	4300	628	AD
1 Mortise Cylinder	80-302	626	SC
1 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Deadlatch Paddle	4590 SERIES	628	AD
2 Closer	5100 x HDCS	ALM	HA
1 Threshold	413S x LAR	MIL	HA
2 Door Sweep	750S N x LAR	CLR	HA
1 Wiring Diagram	RISER/POINT TO POINT		BYOT
1 Power Supply	12/24 VDC AND AMP AS REQUIRED		BYOT

1 Access Control	ACCESS CONTROL READER (BY OTHERS)	BYOT
Weatherstrip	By Aluminum Door / Frame Supplier	
Description of Operation:		
Door is normally closed and locked.		
Presenting authorized credential, retracts latch, granting access or by key over-ride.		
Free egress all times.		
Door to remain locked in the event of power loss (Fail Secure).		

HARDWARE SET # 104
Door: 125A

2 Mortise Cylinder	80-302	626	SC
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
Balance of Hardware	By Sliding Aluminum Door / Frame Manufacturer		

HARDWARE SET # 105
Door: 126A

NOTE: All hardware by sliding aluminum door/frame manufacturer.

HARDWARE SET # 106
Door: 133A

1 Thru Wire Continuous Hinge		780-112HD x LAR RETW	
CLR HA			
1 Exit Device	4501 RIM MLR	US32D	HA
1 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Rim Cylinder	80-329	626	SC
1 Closer	5100 x HDCS	ALM	HA
1 Threshold	413S x LAR	MIL	HA
1 Door Sweep	750S N x LAR	CLR	HA
1 Power Supply	2908		HA
1 Wiring Diagram	RISER/POINT TO POINT		BYOT
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
Weatherstrip	By Aluminum Door / Frame Supplier		

Description of Operation:
Door is normally closed and locked.
Presenting authorized credential, retracts latch, granting access or by key over-ride.
Free egress all times.
Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 107
Door: 148A

1 Thru Wire Continuous Hinge		780-112HD x LAR x	
RETWCLR	HA		
1 Continuous Hinge	780-112HD x LAR	CLR	HA
2 Exit Device	4501 CVR MLR	US32D	HA
1 Rim Cylinder	80-329	626	SC

2 Set Door Pulls	H 22J	US32D	HA
1 Power Operator	8319 PUSH	ALM	HA
2 Actuator	2-659-0178	US32D	HA
1 Threshold	413S x LAR	MIL	HA
1 Door Sweep	750S N x LAR	CLR	HA
1 Power Supply	2908		HA
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT
Weatherstrip	By Aluminum Door / Frame Supplier		

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, retracts latches and engages exterior actuator, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 108

Doors: 109A, 115A, 117A, 120A, 122A, 123A, 129A, 131A

1 Continuous Hinge	780-112HD x LAR	CLR	HA
1 Deadlock	MS1850S	628	AD
1 Mortise Cylinder	80-302	626	SC
1 Thumb Turn Cylinder	3905 x LAR	US26D	HA
1 Set Door Pulls	H 22J	US32D	HA
1 Wall Stop	236W	US32D	HA
Weatherstrip	By Aluminum Door / Frame Supplier		

HARDWARE SET # 109

This set not used

HARDWARE SET # 110

Door: 119C

1 Thru Wire Continuous Hinge	780-112HD x LAR x		
RETWCLR	HA		
1 Electrified Deadlatch	4300	628	AD
1 Mortise Cylinder	80-302	626	SC
1 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Deadlatch Paddle	4590 SERIES	628	AD
1 Closer	5100 x HDCS	ALM	HA
1 Power Supply	12/24 VDC AND AMP AS REQUIRED		BYOT
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, retracts latch, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 111

Door: 151B

2 Thru Wire Continuous Hinge		780-112HD x LAR x	
RETWCLR	HA		
2 Exit Device	4501 CVR MLRX	US32D	HA
1 Rim Cylinder	80-329	626	SC
1 Mortise Cylinder	80-302	626	SC
2 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Power Operator	8319 PUSH	ALM	HA
2 Actuator	2-659-0178	US32D	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Threshold	413S x LAR	MIL	HA
2 Door Sweep	750S N x LAR	CLR	HA
1 Key Switch	29KS ADD RED/GREEN LED'S	US32D	HA
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT
Weatherstrip	By Aluminum Door / Frame Supplier		

HARDWARE SET # 112

Door: 151D

2 Continuous Hinge	780-112HD x LAR	CLR	HA
2 Exit Device	4501 CVR CD	US32D	HA
1 Rim Cylinder	80-329	626	SC
3 Mortise Cylinder	80-302	626	SC
2 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Power Operator	8319 PUSH	ALM	HA
2 Actuator	2-659-0178	US32D	HA
1 Threshold	413S x LAR	MIL	HA
2 Door Sweep	750S N x LAR		CLR
HA	1	Key Switch	29KS
ADD RED/GREEN LED'S	US32D	HA	
Weatherstrip	By Aluminum Door / Frame Supplier		

NOTE: Exit Devices must be "dogged" for operator to work correctly.

HARDWARE SET # 113

Door: 101B

1 Continuous Hinge	780-224HD x LAR x RETW	CLR	HA
1 Electrified Lockset	ND80GD EU RHO	626	SC
1 Latch Guard	341D	US32D	HA
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Threshold	520S N x LAR	MIL	HA
1 Set Weatherstrip	881S N x LAR	MIL	HA
1 Drip Cap	810S x LAR	MIL	HA

1 Power Supply	12/24 VDC AND AMP AS REQUIRED	BYOT
1 Access Control	ACCESS CONTROL READER (BY OTHERS)	BYOT
1 Wiring Diagram	RISER/POINT TO POINT	BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, unlocks lever, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 114

This set not used

HARDWARE SET # 115

Doors: 102A, 141A, 149B, 155A

4 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Closer	5100	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 116

Door: 103A

4 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Office Lock	ND50GD RHO	626	SC
1 Wall Stop	236W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 117

Doors: 104A, 112A, 146A

4 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Privacy Set w/Indicator	L9040 06A L283-722	626	SC
1 Closer	5100	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Mop Plate	190S x 4" x 1" LDW	US32D	HA
1 Wall Stop	236W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 118

Door: 105A

1 Continuous Hinge	780-224HD x LAR	CLR	HA
1 Classroom Lock	ND70GD RHO	626	SC

1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 119

Door: 105B

2 Continuous Hinge	780-224HD x LAR	CLR	HA
2 Push Plate	30S 6 X 16	US32D	HA
2 Deadlock	L463GD	626	SC
1 Closer	5100	ALM	HA
1 Closer	5100 TRK NHOTA	ALM	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Mop Plate	190S x 4" x 1" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
6 Door Silencer	307D	GREY	HA

NOTE: This opening requires a hollow metal fixed mullion.

HARDWARE SET # 120

Doors: 121A, 121C, 121D, 151A

NOTE: All hardware by counter shutter manufacturer.

HARDWARE SET # 121

Doors: 106A, 107A, 134A, 153A, 154A, 156A

4 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Classroom Lock	ND70GD RHO	626	SC
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 122

Doors: 108B, 116A, 119A, 119B

4 Hinge(s)	BB1168 4 1/2 X 4 1/2 NRP	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Electric Strike	2930 CYL	US32D	HA
1 Closer	5100	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
1 Smoke Seal	726 x LAR	S	HA
1 Power Supply	12/24 VDC AND AMP AS REQUIRED		BYOT
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, releases strike, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 123

Doors: 111A, 113A, 114A

4 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Privacy Set w/Indicator	L9040 06A L283-722	626	SC
1 Closer	5100	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Mop Plate	190S x 4" x 1" LDW	US32D	HA
1 Wall Stop	236W	US32D	HA
1 Smoke Seal	726 x LAR	S	HA

HARDWARE SET # 124

Door: 121B

3 Hinge(s)	BB1168 4 1/2 X 4 1/2 NRP	US26D	HA
1 Office Lock	ND50GD RHO	626	SC
1 Closer	5100	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
1 Smoke Seal	726 x LAR	S	HA

HARDWARE SET # 125

Door: 124A

4 Hinge	BB1279 4 1/2 X 4 1/2 NRP	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Electric Strike	2930 CYL	US32D	HA
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Smoke Seal	726 x LAR	S	HA
1 Power Supply	12/24 VDC AND AMP AS REQUIRED		BYOT
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, releases strike, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 126

Door: 124B

4 Hinge	BB1279 4 1/2 X 4 1/2 NRP	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Electric Strike	2930 CYL	US32D	HA
1 Closer	5100 x HDCS	ALM	HA

1 Kick Plate	190S 8" x 2" LDW	US32D	HA
3 Door Silencer	307D	GREY	HA
1 Power Supply	12/24 VDC AND AMP AS REQUIRED		BYOT
1 Access Control	ACCESS CONTROL READER (BY OTHERS)		BYOT
1 Wiring Diagram	RISER/POINT TO POINT		BYOT

Description of Operation:

Door is normally closed and locked.

Presenting authorized credential, releases strike, granting access or by key over-ride.

Free egress all times.

Door to remain locked in the event of power loss (Fail Secure).

HARDWARE SET # 127

Door: 128A

4 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Privacy Set w/Indicator	L9040 06A L283-722	626	SC
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 128

Door: 132A

3 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Exit Device	4501 RIM	US32D	HA
1 Exit Device Trim	45NL WTN	US26D	HA
1 Rim Cylinder	80-329	626	SC
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 129

Doors: 136D, 136E, 138A, 138E

3 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
1 Exit Device	4501 RIM	US32D	HA
1 Exit Device Trim	45CE WTN	US26D	HA
1 Mortise Cylinder	80-302	626	SC
1 Closer	5100	ALM	HA
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 130

Doors: 134B, 135A, 139A, 139D

8 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
2 Exit Device	4501 LBR	US32D	HA
2 Exit Device Trim	45CE WTN	US26D	HA
2 Mortise Cylinder	80-302	626	SC
2 Closer	5100	ALM	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
2 Wall Stop	232W	US32D	HA
2 Meeting Stile Astragals	802S B x LAR	MIL	HA
2 Door Silencer	307D	GREY	HA

HARDWARE SET # 131

Door: 135B

8 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
2 Flush Bolt	282D 24" TOP ROD	US26D	HA
1 Dust Proof Strike	280X	US26D	HA
1 Classroom Lock	ND70GD RHO	626	SC
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
2 Wall Stop	232W	US32D	HA
2 Door Silencer	307D	GREY	HA
1 Astragal	ASTRAGAL BY DOOR MANUFACTURER		BYOT

HARDWARE SET # 132

Doors: 136A, 136B, 136C, 138B, 138C, 138D

8 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
2 Flush Bolt	282D 24" TOP ROD	US26D	HA
1 Dust Proof Strike	280X	US26D	HA
1 Office Lock	ND50GD RHO	626	SC
2 Overhead Stop	7016 SRF	US32D	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
2 Door Silencer	307D	GREY	HA
1 Astragal	ASTRAGAL BY DOOR MANUFACTURER		BYOT

HARDWARE SET # 133

Door: 137A

8 Hinge	BB1279 4 1/2 X 4 1/2	US26D	HA
2 Exit Device	4501 LBR	US32D	HA
2 Closer	5100 x HDCS	ALM	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
2 Meeting Stile Astragals	802S B x LAR	MIL	HA
2 Door Silencer	307D	GREY	HA
2 Electromagnetic Door Holder		380F	LS

HA

HARDWARE SET # 134

Door: 140A

6 Hinge(s)	BB1168 4 1/2 X 4 1/2	US26D	HA
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1 Exit Device	4501 SVR F LBR	US32D	HA
1 Exit Device	4501 SVR F LBR LBR W/FIRE BOLT	US32D	HA
2 Exit Device Trim	45BE WTN	US26D	HA
1 Closer	5100 x HDCS	ALM	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
2 Meeting Stile Astragals	802S B x LAR	MIL	HA
1 Smoke Seal	726 x LAR	S	HA
2 Electromagnetic Door Holder		380F	LS
HA			

NOTE: Connect the Electro-magnetic Door Holder to the life safety system to release upon activation.

HARDWARE SET # 135

Door: 142A

1 Continuous Hinge	780-224HD x LAR	CLR	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Smoke Seal	726 x LAR	S	HA

HARDWARE SET # 136

Door: 149A

8 Hinge(s)	BB1279 4 1/2 x 4 1/2 NRP	US26D	HA
2 Flush Bolt	282D 24" TOP ROD	US26D	HA
1 Dust Proof Strike	280X	US26D	HA
1 Storeroom Lock	ND80GD RHO	626	SC
1 Closer	5100 x HDCS	ALM	HA
1 Overhead Stop	7016 SRF	US32D	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
2 Door Silencer	307D	GREY	HA
1 Astragal	ASTRAGAL BY DOOR MANUFACTURER		BYOT

HARDWARE SET # 137

Door: 151C

2 Continuous Hinge	780-112HD x LAR	CLR	HA
2 Exit Device	4501 CVR	US32D	HA
2 Door Pull	H 12J TYPE 5 MOUNTING	US32D	HA
1 Rim Cylinder	80-329	626	SC
2 Mortise Cylinder	80-302	626	SC
2 Closer	5100 x HDCS	ALM	HA
1 Threshold	413S x LAR	MIL	HA
2 Door Sweep	750S N x LAR	CLR	HA

HARDWARE SET # 138

Door: 153B

8 Hinge(s)	BB1168 4 1/2 X 4 1/2 NRP	US26D	HA
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2 Exit Device	4501 LBR	US32D	HA
2 Exit Device Trim	45CE WTN	US26D	HA
2 Mortise Cylinder	80-302	626	SC
2 Closer	5100 x HDCS	ALM	HA
2 Kick Plate	190S 8" x 2" LDW	US32D	HA
2 Wall Stop	232W	US32D	HA
2 Meeting Stile Astragals	802S B x LAR	MIL	HA
2 Door Silencer	307D	GREY	HA

HARDWARE SET # 139

Door: 157A

4 Hinge(s)	BB1279 4 1/2 x 4 1/2 NRP	US26D	HA
1 Classroom Lock	ND70GD RHO	626	SC
1 Overhead Stop	7016 SRF	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 140

Door: 157B

4 Hinge(s)	BB1279 4 1/2 x 4 1/2 NRP	US26D	HA
1 Classroom Lock	ND70GD RHO	626	SC
1 Closer	5100 x HDCS	ALM	HA
1 Kick Plate	190S 8" x 2" LDW	US32D	HA
1 Wall Stop	232W	US32D	HA
3 Door Silencer	307D	GREY	HA

HARDWARE SET # 141

Door: MISC

1 8300 Programmer	2-679-0907		HA
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NOTE: One programmer required to program all operators on project.

END of SECTION

SECTION 08 80 00
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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
 - 3. Aluminum framed entrances and storefronts.
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants" for joint sealants other than those specified in this section.
 - 2. Division 08 Section "Aluminum framed entrances and storefronts" for aluminum framed entrance assemblies and storefronts.
 - 3. Division 08 Section "Aluminum Windows" for aluminum framed windows.
 - 4. Division 08 Section "Mirrors" for unframed mirrors.
 - 5. Division 08 Section "Hollow Metal Doors and Frames" for hollow metal doors and hollow metal window frames.

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.
- D. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for 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.

1.4 PERFORMANCE REQUIREMENTS

- A. California Code of Regulations, Title 24, Part 6, California Energy Code.
 - 1. NFRC 100: Procedure for Determining Fenestration Product U-factors." November 2002
 - 2. NFRC 200 Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence." November 2002
 - 3. NFRC 400: Procedure for Determining Fenestration Product Air Leakage." January 2002
- B. California Building Code, Title 24, Part 2, Section 2406.
- C. 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.
- D. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: In accordance with the California Building Code.
 - b. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
 - 1) For monolithic-glass lites heat treated to resist wind loads.
 - 2) For insulating glass.
- E. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation 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.

1.5 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.

- B. Product Data: For each glass product and associated glazing material indicated.
 - 1. Include statement of VOC content for any adhesives or sealants.
- C. Glass Samples: For each type of glass product, other than clear monolithic glass, in 12-inch square samples.
- D. Glazing Accessory Samples: For gaskets, sealants, and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- F. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass, insulating glass, glazing sealants, and glazing gaskets.
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance.
- B. Source Limitations for Glass: Obtain tinted float glass, coated float glass, laminated glass, and, insulating glass from a single source from a single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain products from a single source from a single manufacturer for each product and installation method.
- D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to referenced publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
 - 2. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
- E. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable

to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1. Safety glazing shall comply with testing requirements of CPSC 16 CFR 1201.

F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

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 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install 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 for Coated-Glass Products: Manufacturer's standard form in which coated-glass 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.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Products: In other Part 2 articles where manufacturers and products are named, the Project 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. PPG Industries, Inc.
 3. Oldcastle Building Envelope
 4. Pilkington Building Products North America.
 5. Viracon.

2.2 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.
- C. 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 insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 2. 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.
 3. 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.
 4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Fully Tempered Float Glass: ASTM C1048, 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.
- C. Heat-Strengthened Float Glass: ASTM C1048, 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. Ceramic-Coated Vision Glass: Heat-treated float glass, Condition C; with ceramic enamel applied by silk-screened process; complying with Specification No. 95-1-31 in GANA's Tempering Division's "Engineering Standards Manual" and with other requirements specified.
1. Provide named manufacturer's product complying with requirements specified in other Part 2 Articles.

2.4 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, and complying with other requirements specified.
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 Aluminum with black, color anodic finish.
 3. Desiccant: Molecular sieve or silica gel, or blend of both.
 4. Corner Construction: Manufacturer's standard corner construction.
- B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.
1. Provide Kind HS (heat-strengthened) 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. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.

2.5 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
1. EPDM, ASTM C 864.
 2. Silicone, ASTM C 1115.
 3. Thermoplastic polyolefin rubber, ASTM C 1115.

- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM or silicone gaskets complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

2.6 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 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: Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 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 804.3 tape, where indicated.
 - 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; packaged on rolls with release liner protecting adhesive; 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: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.10 MONOLITHIC GLASS TYPES SCHEDULE

- A. Type G: Clear float glass.
 1. Thickness: 6.0 mm.

2.11 INSULATING-GLASS TYPES SCHEUDLE

A. Type IG: Low-e coated, clear insulating glass.

1. Overall Unit Thickness: 1-inch (25mm).
2. Thickness of Each Glass Lite: 6.0 mm.
3. Interspace Content: Clean-Dry-Air.
4. Outdoor Lite: Clear float glass.
5. Indoor Lite: Clear float glass.
6. Low-E Coating: Pyrolytic or sputtered on second surface.
7. Solar Heat Gain Coefficient (SHGC): 0.30
8. Visible transmittance: 50 Percent
9. U-Factor: 0.30 maximum.

B. Type TIG: Low-e coated, clear, fully tempered insulating glass.

1. Overall Unit Thickness: 1-inch (25mm).
2. Thickness of Each Glass Lite: 6.0 mm.
3. Interspace Content: Clean-Dry-Air.
4. Outdoor Lite: Fully tempered float glass.
5. Indoor Lite: Fully tempered float glass.
6. Low-E Coating: Pyrolytic or sputtered on second surface.
7. Solar Heat Gain Coefficient (SHGC): 0.30
8. Visible transmittance: 50 Percent
9. U-Factor: 0.30 maximum.
10. Provide safety glazing labeling where tempered glass is specified.

C. Type OIG: Low-e coated, obscure, tempered insulating glass.

1. Overall Unit Thickness: 1-inch (25mm).
2. Thickness of Each Glass Lite: 6.0 mm.
3. Interspace Content: Clean-Dry-Air.
4. Outdoor Lite: Fully tempered float glass.
5. Indoor Lite: Clear fully tempered float glass.
6. Low-E Coating: Pyrolytic or sputtered on second surface.
7. Frosted: Opacity to be determined.
8. Solar Heat Gain Coefficient (SHGC): 0.30
9. Visible transmittance: To be determined.
10. U-Factor: 0.30 maximum.
11. Provide safety glazing labeling where tempered glass is specified.

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.
- C. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).
- D. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, window framing, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lights.
- G. 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.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. 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.
- L. 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 just 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. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 08 83 00
MIRRORS

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 types of silvered flat glass mirrors.
 - 1. Annealed monolithic glass mirrors.
 - 2. Frameless tempered glass mirrors qualifying as safety glazing.
- B. Related Sections include the following:
 - 1. Division 08 Section "Glazing" for window glass and glazing.
 - 2. Division 10 Section "Toilet Room Accessories" for metal-framed mirrors.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

1.4 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated, include the following:
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
 - 2. Mirror mastic.
 - 3. Mirror hardware.
 - 4. Statement of VOC content for any adhesives or sealants.
- C. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.
- D. Product Certificates: For each type of mirror and mirror mastic, signed by product manufacturer.

- E. Mirror Mastic Compatibility Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing film and substrates on which mirrors are installed.
- F. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed mirror glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in mirror installations with a record of successful in-service performance.
- B. Source Limitations for Mirrors: Obtain mirrors from one source for each type of mirror indicated.
- C. Source Limitations for Mirror Glazing Accessories: Obtain mirror glazing accessories from one source for each type of accessory indicated.
- D. Glazing Publications: Comply with the following published recommendations:
 - 1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
 - 2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- E. Safety Glazing Products: For tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
- F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing film and substrates on which mirrors are installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

- B. Field Measurements: 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.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

- 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

- A. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Gardner Glass Products.
 - 2. Gilded Mirrors, Inc.
 - 3. Guardian Industries Corp.
 - 4. Independent Mirror Industries, Inc.
 - 5. Lenoir Mirror Company.
- C. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.
 - 1. Nominal Thickness: 6.0 mm.

2.2 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

- C. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Laurence, C. R. Co., Inc.
 - b. Pecora Corporation.
 - c. Royal Adhesives & Sealants; Gunther Mirror Mastics Division.
 2. Adhesive shall have a VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MIRROR HARDWARE

- A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.05 inch.
 2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.062 inch.
 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bottom Trim: C. R. Laurence, Inc.; CRL Standard "J" Channel.
 - b. Top Trim: C. R. Laurence, Inc.; CRL Deep "J" Channel.
 4. Finish: Satin clear anodized aluminum.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Mirror Sizes: To suit Project conditions, and before tempering, cut mirrors to final sizes and shapes.
- C. Cutouts: Fabricate cutouts before tempering for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

- D. Mirror Edge Treatment: Rounded polished edge.
 - 1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
- C. Proceed with mirror installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
 - 1. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
 - a. Apply mastic to wall surface in vertical squiggles spaced approximately 12 inches on center.
 - 2. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between

setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.

3. Top Channel/Cleat and Bottom Aluminum J-Channels: Fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
4. Install J-channels in continuous lengths matching widths of mirrors.

3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION

SECTION 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 partitions.
 - 2. Grid suspension systems for gypsum board ceilings.
- B. Related Requirements:
 - 1. Division 05 Section "Structural Steel Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; and roof rafters and ceiling joists.
 - 2. Division 09 Section "Gypsum Board" for gypsum board attached to steel framing systems.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated, include manufacturer's written installation procedures and details.
- C. Evaluation Reports: For metal framing system from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction..
- D. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be a current member of the Steel Stud Manufacturers Association (SSMA).
- B. Source Limitations: Obtain metal framing systems for a single source from a single manufacturer.

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 E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
 - 1. CEMCO, California Expanded Metal Products Company.
 - 2. Clarkwestern Dietrich Building Systems LLC.
 - 3. MarinoWare; a division of Ware Industries.
 - 4. MRI Steel Framing, LLC.

2.3 FRAMING SYSTEMS

- A. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Steel Thickness: As indicated on Drawings.
- B. Hat-Shaped, Rigid Furring Channels: ASTM C645.
 - 1. Minimum Base-Steel Thickness: As indicated on Drawings.
 - 2. Depth: As indicated on Drawings.
- C. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Hat shaped.
- D. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.8 mm).
 - 3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

- E. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-steel thickness of 0.0179 inch (0.455 mm), and depth required to fit insulation thickness indicated.

2.4 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.
- B. Hanger Attachments to Wood and Steel: As shown on Drawings.
- C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.
- D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.
 - 1. Depth: As indicated on Drawings.
- E. Furring Channels (Furring Members):
 - 1. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch (22 mm) deep.
 - a. Minimum Base-Steel Thickness: As indicated on Drawings.
 - 2. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.
 - a. Configuration: Hat shaped.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

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 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- 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.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
 - 1. 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.
 - 2. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- C. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

D. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches (610 mm) o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
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 (305 mm) from corner and cut insulation to fit.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION

SECTION 09 29 00
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. This Section includes the following:
 - 1. Interior gypsum board.
- B. Related Sections include, but are not limited to the following:
 - 1. Division 07 Section "Insulation" for batt and blanket insulation and vapor retarders installed in assemblies that incorporate gypsum board.
 - 2. Division 07 Section "Penetration Firestopping" for sealing of penetration at rated walls.
 - 3. Division 07 Section "Joint Firestopping" for sealing of joints at rated walls.
 - 4. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
 - 5. Division 09 Section "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
 - 6. Division 09 Section "Tiling" for cementitious backer units installed as substrates for ceramic tile.
 - 7. Division 09 Section "Painting" for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. 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.
- C. Samples: For the following products:
 - 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, install mockups to demonstrate aesthetic effects and set quality standards for materials and execution. Mockups shall be installed at locations as directed by architect and shall include full walls where practical.
 - 1. Install mockups for 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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT 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 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. CertainTeed Corporation.
- 2. Georgia-Pacific Gypsum.
- 3. National Gypsum Company.
- 4. USG Corporation.
- 5. American Gypsum Co.
- 6. PABCO Gypsum.

- B. Gypsum Wallboard: Provide gypsum wallboard complying with ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated.

- 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. Products:
 - 1) CertainTeed Corporation; M2Tech Moisture & Mold Resistant Drywall
 - 2) National Gypsum Company; Gold Bond XP Gypsum Board
 - b. Core: 5/8 inch.
 - c. Long Edges: Tapered.
 - d. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

4. Acoustically Enhanced Type: ASTM C1396/C1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
 - a. Products:
 - 1) Pabco Gypsum; QuietRock ES
 - b. Core: 5/8 inch (15.9 mm), Type X.
 - c. Long Edges: Tapered.
5. Gypsum Ceiling Board: Special sag-resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - a. Products:
 - 1) American Gypsum; Interior Ceiling Board.
 - 2) CertainTeed Corporation; Interior Ceiling Drywall.
 - 3) National Gypsum Company; Hi-Strength Gypsum Ceiling Panels.
 - b. Thickness: 1/2 inch (12.7 mm).
 - c. Long Edges: Tapered.

2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
 1. Products:
 - a. Georgia-Pacific Gypsum; DenseShield Tile Backer.
 - b. National Gypsum Company; Gold Bond e2CP Tile Backer.
 2. Core: 5/8 inch (15.9 mm), Type X.
 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
 1. Products:
 - a. National Gypsum Company; PermaBase Brand Cement Board.
 - b. USG Corporation; Durock Brand Cement Board.
 - c. James Hardie Building Products, Inc; Hardibacker Cement Board.
 2. Thickness: 5/8 inch (15.9 mm).
 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.5 METAL ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - 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.
- e. Expansion (control) joint.

B. Interior Drywall Reveals and Moldings:

1. Basis of Design: Drawings and specifications are based on the following:
 - a. Fry Reglet Corporation
 - 1) Subject to compliance with requirements, provide the specified product or equivalent product to be reviewed and approved by Architect.
2. Material: Extruded aluminum.
3. Finish: Architect shall select from manufacturer's anodized standard finishes.
4. Shapes:
 - a. Reveal Channel Screed/Control Joint: Screed for vertical or horizontal break in finish.
 - 1) Functions as a control join in stucco and plaster applications when installed per ASTM C1063.
 - b. Z-Reveal Molding: Reveal molding around doors or between walls and floors.
5. Dimensions: As indicated on drawings.

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. Prefilling: 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.
- D. Joint Compound for Tile Backing Panels:
 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 2. Cementitious Backer Units: As recommended by backer unit 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.
- D. Acoustical Sealant: Non-hardening, non-skinning for use in conjunction with gypsum board.
- E. Insulation: As specified in Division 07 Section "Insulation."

2.8 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
 - 1. Coordinate primers with Division 09 Section "Painting."
 - 2. Finish: See Finish Schedule

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Where gypsum panels are installed over structural or acoustical sheathing panels, increase the length of fasteners an amount equal to not less than the thickness of the sheathing panels.
- J. 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.
- K. Install thermal and sound attenuation batt/blanket insulation before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

1. Coordinate gypsum panel installation with insulation work specified in Division 07 Section "Insulation."

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: At vertical and horizontal surfaces, unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assemblies.
3. Acoustically Enhanced Type: Where required for acoustic-rated assemblies.
4. Moisture and Mold-Resistant Type: At walls of toilet rooms, janitor rooms, kitchen, 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.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer 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, 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.

3.4 INSTALLATION OF TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at showers and where indicated. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated.

3.5 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.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except 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:
 - 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.
 - b. Primer and its application to surfaces are specified in other Division 09 Sections.
 - 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.

3.7 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture 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.

3.8 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 09 30 00
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. Waterproof membrane.
- 3. Crack isolation membrane.
- 4. 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 portland cement scratch coat over metal lath on wall surfaces.
- 4. Division 09 Section "Gypsum Board" for backer board units.

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 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on level walkway surfaces, provide products with a minimum static coefficient of friction of 0.6 as determined by testing identical products per ASTM C 1028,

1.5 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- D. 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.
- E. Material Test Reports: For each tile-setting and -grouting product and special-purpose tile.

1.6 QUALITY ASSURANCE

- 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. Waterproofing.
 - 2. Crack isolation membrane.
 - 3. Joint sealants.
 - 4. Metal edge strips.

1.7 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 requirement in ANSI A137.1 for labeling sealed 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 avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.8 PROJECT 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. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

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 standards referenced in "Setting and Grouting Materials" Article.
- C. 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 TCA installation methods specified in tile installation schedules, and other requirements specified.
- D. 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.
- E. 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.
- F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.
- G. 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.
- B. Unglazed Wall Tile, Field (W-39):
 1. Style Name: Daltile, Composition Porcelain
 2. Composition: Porcelain
 3. Module Size: See Finish Schedule
 4. Thickness: 3/8 inch.
 5. Face: Plain with cushion edges.
 6. Finish: Semi-Gloss
 7. Color and Pattern: To be selected by Architect
- C. 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. External Corners for Portland Cement Mortar Installations: Bullnose shape with radius of at least 3/4 inch unless otherwise indicated.
 2. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

2.4 NON-CERAMIC TRIM

- A. Wall Base: Satin anodized aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Application: Use at floor-to-wall transitions.
 - 2. Product: 4.22 Schluter; DILEX-AHKA.
 - 3. Include manufacturer recommended accessories for end caps, outside corner and inside corner applications.
- B. Tile Trim: Satin anodized aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Application: Top of tile transition.
 - 2. Product: 2.5 Schluter; RONDEC-DB.
 - 3. Include manufacturer recommended accessories for end caps, outside corner and inside corner applications.

2.5 WATERPROOF AND CRACK ISOLATION MEMBRANES

- A. Waterproof and Crack Isolation Membranes: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 for waterproof membranes and ANSI A118.12 for high performance crack isolation membranes, and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
 - 1. Chlorinated-Polyethylene-Sheet Product: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric, 0.030-inch nominal thickness.
 - a. Available Products:
 - 1) Waterproof Membrane: Noble Company (The); Nobleseal TS.
 - 2) Crack Isolation Membrane: Noble Company (The); Nobleseal CIS.
 - 2. PVC Sheet: Two layers of PVC sheet heat-fused together and to facings of nonwoven polyester; 0.040-inch nominal thickness.
 - a. Available Product: Compotite Corporation; Composeal Gold (Waterproof and/or crack isolation membrane).
 - 3. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
 - a. Available Product: Schluter Systems L.P.; KERDI (Waterproof and/or crack isolation membrane).
 - 4. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

- a. Subject to compliance with requirements, provide one of the following (Waterproof and/or crack isolation membrane):
 - 1) Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - 2) Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
 - 3) MAPEI Corporation; Mapelastic L (PRP M19).
 - 4) MerKrete Products, Inc.; Hydro-Guard 2000.
 - 5) Summitville Tiles, Inc.; S-9000.

2.6 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.

2.7 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.

2.8 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."

2.9 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.

2.10 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 installed tile.
 - 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 with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
- C. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot 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 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.
- 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. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- E. Jointing Pattern: See Finish Schedule. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. 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.

- F. Joint Widths: Following tile manufacturer's recommendations for grout joint widths, confirm with Architect that the manufacturer's recommendations are acceptable. If there are not joints widths recommend by the manufacturer consultant with the Architect prior to installation.
- G. Lay out tile wainscots to next full tile beyond dimensions indicated.
- H. 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."
- I. Cove Metal Trim: Install cove trim at floor-to-wall transitions per manufacturer's written installation instructions.
- J. Metal Edge Strips: Install where exposed edge of tile meets carpet, wood, or other wall surface that finishes flush with or above top of tile.
- 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 WATERPROOFING MEMBRANE INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 CRACK-ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.
- B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.6 CLEANING AND PROTECTING

- A. 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.
- B. 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.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 09 51 13
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.

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 Verification: For each component indicated and for each exposed finish required, prepared on Samples of size 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.
- C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- D. Maintenance Data: For finishes to include in maintenance manuals.

1.4 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.

1.5 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. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.6 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 REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Acoustical panels shall have surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84 and having a Smoke-Developed Index of 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Panels: Obtain each type from a single source from a single manufacturer.
 - 2. Suspension Systems: Obtain each type from a single source from a single manufacturer.
- B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- C. 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.

- D. 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.
- E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 ACOUSTICAL PANEL TYPES

- A. 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.
- B. Acoustical Panel Types:
 - 1. Type AC-1: Armstrong World Industries; ULTIMA Lay-in, No. 1913HRC.
 - a. Type and Form: Type IV, mineral fiber with acoustically transparent membrane, factory-applied latex paint; Form 2.
 - b. Pattern: ASTM E1264 pattern E.
 - c. Size: 24 x 48 x 3/4 inches.
 - d. Edge: Square Lay-in 15/16 in.
 - e. Color: White.
 - f. LR: Not less than 0.90.
 - g. NRC: Not less than 0.75.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. 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.
- B. Attachment Devices: Size 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.
 - 1. Anchors in Concrete: Postinstalled type expansion anchors with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as

determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

- a. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
- C. Wire Hangers, Braces, and Ties: Zinc-coated, carbon-steel wire, ASTM A 641/A 641M, Class 1 zinc coating, soft temper. Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 12 gage (0.106 inch diameter) wire.
- D. Perimeter Seismic Clips: Manufacturer's proprietary perimeter seismic clips as necessary to comply with standards indicated.
- E. Seismic Expansion Joints: Manufacturer's standard seismic expansion joints as necessary to comply with standards indicated.

2.5 METAL SUSPENSION SYSTEM TYPES

- A. FOR SUSPENDED WOOD CEILINGS: 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: Black.
 - 6. Products: Subject to compliance with requirements, provide one of 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. Chicago Metallic Corp., 1200 (ER-1905).
 - 1) Main Runners: No. 200.01H.
 - 2) Cross Runners: No. 1214.01H (4'), 1202.01H (2').
 - 3) Perimeter Seismic Clips: No. 1496.
- B. FOR TYPICAL SUSPENDED CEILINGS: Narrow-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, cold-rolled, 9/16-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. Color and Finish: Blizzard White, Powder-coated finish
5. Cap Material: Aluminum.
6. Cap Finish: Painted white.
7. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, SILHOUETTE XL ¼" Reveal (ESR-1308).

- 1) Main Runners: No. 7601.
- 2) Cross Runners: No. XL7620 (2').
- 3) Perimeter Seismic Clips: No. BERC2.

b. Chicago Metallic Corp., 4000 Tempra (ER-1905).

- 1) Main Runners: No. 4040.01CH.
- 2) Cross Runners: No. 4014.01CH (4'), 4022.01 (2').
- 3) Perimeter Seismic Clips: No. 1496.

C. Edge Moldings and Trim: Manufacturer's standard roll formed sheet metal edge moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard angle edge molding with hemmed edges having nominal 7/8 inch legs that fit acoustical panel edge details and suspension systems indicated.
2. Provide manufacturer's proprietary perimeter seismic clips at ends of main and cross runners at wall angles to comply with seismic standards indicated.
3. 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.
4. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.6 ACOUSTICAL SEALANT

A. Acoustical Sealant: 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.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Hanger Wires: Suspend ceiling hanger wires from building's structural members and attach to grid members as indicated on Drawings and as follows:
 - 1. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns in 1-1/2 inches. Connect hangers directly either to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 2. Space hangers not more than 48 inches on center along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 3. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 4. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
 - 5. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

6. Do not support ceilings directly from permanent metal forms, floor or roof deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
- C. Seismic Bracing: Seismic bracing assemblies 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. Brace wires shall attach to main runners within 2 inches of the intersection of main and cross runners. The slope of brace wires shall not exceed 45 degrees from the plane of the ceiling.
 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 be exempt from bracing requirements.
- D. Edge Molding and Trim: Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 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.
- E. Suspension System Runners: Install suspension-system runners so they are level, square, and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Expansion Joints: Provide expansion joints as indicated on Drawings and as follows:
1. Ceiling areas exceeding 2,500 square feet shall be separated by seismic joints so that no area exceeds 2,500 square feet.
 2. Expansion joints shall be provided at the intersections of corridors and at junctions of corridors with lobbies or similar areas.

- G. 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. Penetrations: Penetrations through ceiling panels for sprinkler heads and similar rigid penetrating items that are not connected to the ceiling system shall have 2 inch oversized openings to allow for horizontal movement of 1 inch in all directions. Penetrations shall be finished with escutcheons to seal off oversized openings.
 - a. Flexible pipe penetrations shall not require oversize openings.
 4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
 5. Arrange directionally patterned acoustical panels with pattern running in one direction.
 6. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.

3.4 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. Testing and inspecting shall be required for the following:
1. Power-actuated and post installed anchors in concrete for hanger and brace wires.
 - a. Extent of Test Area: Within each test area, testing agency will select 1 of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every 2 postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
 - b. 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.

3.5 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 09 60 01
FLOORING MOISTURE AND ALKALINITY 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 alkalinity 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 Requirements."
 - 2. Division 03 Section "Cast-in-Place Concrete"
 - 3. Division 09 Sections as applicable to adhered flooring materials.

1.3 REFERENCES

- A. ASTM F1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor using Anhydrous Calcium Chloride.
- B. ASTM F710 Standard Practice for Preparing Concrete Floors to receive Resilient Flooring.
- C. ASTM F2170 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 PROJECT 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. ASTM F1869 Test Kit as manufactured by American Moisture Test, Inc.
 - a. Non-recycled anhydrous calcium chloride at 94% purity.
 - b. Dome with self adhesive butyl sealant.
 - c. Calcium chloride container:
 - 1) Content weight limited to 16 grams +/- 1 gram.
 - 2) Dimensions: 69mm +/- 1mm diameter with 16mm +/- 1mm height.
 - d. Gram Scale: Calibrated to 0.1 grams by American Moisture Test, Inc. or similar.
 - e. Concrete Surface Temperature: IR 100 by Extech.
 - f. Temperature/ Humidity Meter: Extech 44550 or similar.
 - 2. ASTM F710 Meter "pH 100" as manufactured by Extech.
 - a. Digital wide range 1-14 pH meter.
 - b. Waterproof flat tip.

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 and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. 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.
 - a. Where topical concrete vapor control barriers have been applied, clean surface of contamination and directly apply testing equipment 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 "Project Conditions" before, during, and after testing.

3.2 TESTING

- A. Testing: Testing Agency shall perform tests as follows:
 1. Anhydrous calcium chloride test, ASTM F 1869.
 - a. Perform all gram scale weights on site.
 - b. Expose dome for 60 to 72 hours.
 - c. 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. Alkalinity Testing:
 - 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 have a maximum pH level of 10.
 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.

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 ± 10° F

Results	Moisture Vapor Emission Rate (MVER) / Relative Humidity	Alkalinity
Highest	/	
Lowest	/	
Acceptable	3.0 lbs. / 75% RH	9.0pH

Location	ASTM F-1869-04 Calcium Chloride Data							Results	
	Start	End	Elapsed Time	Start Weight	Ending Weight	Weight Gain	Concrete Surface Temp Start / End	pH	MVER / Relative Humidity
	Date/Time	Date/Time							

END OF SECTION

SECTION 09 65 13
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. Rubber stair accessories.
- B. Related Sections:
 - 1. Division 03 Sections "Cast-In-Place Concrete."
 - 2. Division 09 Section "Flooring Moisture and Alkalinity Testing."
 - 3. Division 09 Sections as applicable to flooring products and systems.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated.
 - 1. Include statement of VOC content for any adhesives or sealants.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Product Schedule: For resilient products.

1.4 QUALITY ASSURANCE

- 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.

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 PROJECT 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. 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 - TRADITIONAL

- A. Resilient Base:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johnsonite
 - b. Armstrong World Industries, Inc.
 - c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - d. Roppe Corporation, USA.
- B. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement: Type TS (rubber, vulcanized thermoset).
 - 2. Manufacturing Method: Group I (solid, homogeneous).
 - 3. Style: Cove (base with toe).
- C. Minimum Thickness: 0.125 inch.
- D. Height: 6 inches unless otherwise indicated on Drawings.
- E. Lengths: Cut lengths, 48 inches long or coils in manufacturer's standard length.
- F. Outside Corners: Preformed.

- G. Inside Corners: Job formed or preformed.
- H. Finish: As selected by Architect from manufacturer's full range of manufacturer's finishes.
- I. Colors and Patterns: 167 Fudge.

2.2 RESILIENT BASE – MILLWORK STYLE

A. Resilient Base:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johnsonite
 - b. Armstrong World Industries, Inc.
 - c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - d. Roppe Corporation, USA.

B. Resilient Base Standard: ASTM F 1861.

- 1. Material Requirement: Type TS (rubber, vulcanized thermoset).
- 2. Manufacturing Method: Group I (solid, homogeneous).
- 3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125 inch.

D. Height: 6 inches unless otherwise indicated on Drawings.

E. Lengths: Cut lengths, 48 inches long or coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Job formed or preformed.

H. Finish: As selected by Architect from manufacturer's full range of manufacturer's finishes.

I. Colors and Patterns: Reveal 167 Fudge.

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. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. 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.
- E. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

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.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.

4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
 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 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Inside Corners: Use straight pieces of maximum lengths possible.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Damp-mop surfaces to remove marks and soil.
 - 3. Coordinate Cleaning of resilient base and accessories with cleaning of adjacent floor 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.

END OF SECTION

SECTION 096516
RESILIENT SHEET 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 sheet floor covering.
- B. Related Sections:
 - 1. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.
 - 2. Division 09 Section "Resilient Tile Flooring" for resilient floor tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- C. Samples for Initial Selection: For each type of floor covering indicated.
- D. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9 inch sections of each different color and pattern of floor covering required.
- E. Maintenance Data: For each type of floor covering to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation indicated.
- B. 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store floor coverings 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 rolls upright.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 68 deg F or more than 85 deg F, in spaces to receive floor coverings during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 60 deg F or more than 85 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install floor coverings after other finishing operations, including painting, have been completed.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of resilient sheet flooring that fails within specified warranty period.
 - 1. Warranty does not include deterioration or failure due to unusual traffic, vandalism, adhesive failure due to moisture or alkaline from the sub-floor, or abuse.
 - 2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 VINYL SHEET FLOOR COVERING

- A. Basis of Design Product: Subject to compliance with requirements, provide the following:
 - 1. Patcraft; 20 mil, Style to be selected by Architect
 - a. Comparable products: In lieu of Basis of Design product and subject to compliance with requirements, provide a comparable product by one of the following:
 - 1) Congoleum Corporation.
 - 2) Forbo Flooring, Inc.
 - 3) Tarkett, Inc.

- B. Seaming Method: Heat welded at adjacent sheet goods, chemical welded at adjacent luxury vinyl tile.
- C. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 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 floor covering and substrate conditions indicated.
- C. Seamless-Installation Accessories:
 - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: Match floor covering.
 - 2. Chemical-Welding Bead (for smooth transition to Vinyl Tile): Two-part polyester polyurethane polymer-fortified, non-flammable seam sealer.
 - a. Color: Match floor covering.
- D. Integral-Flash-Cove-Base Accessories:
 - 1. Cove Strip: 1-inch radius provided or approved by manufacturer.
 - 2. Top Edge Strip: Square metal, provided or approved by manufacturer.
- E. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

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.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.
- C. 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 floor coverings.

- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - a. Remove adhesive residue from areas where adhesively applied flooring has been removed.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM 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.
- 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 coverings until they are same temperature as space where they are to be installed.
 - 1. Move floor coverings 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 floor coverings immediately before installation.

3.3 FLOOR COVERING INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor coverings.
- B. Unroll floor coverings and allow them to stabilize before cutting and fitting.
- C. Lay out floor coverings as follows:
 - 1. Maintain uniformity of floor covering direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in floor covering substrates.
 - 3. Match edges of floor coverings for color shading at seams.
 - 4. Avoid cross seams.
- D. Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
 - 1. Seams adjacent to other floor materials to be flush for smooth transition. Transition strips will not be allowed in public spaces.
- E. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

- F. Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
- I. Integral-Flash-Cove Base: Cove floor coverings 6 inches up vertical surfaces. Support floor coverings at horizontal and vertical junction by cove strip. Butt at top against top edge strip.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor coverings.
- B. Perform the following operations immediately after completing floor covering installation:
 - 1. Remove adhesive and other blemishes from floor covering surfaces.
 - 2. Sweep and vacuum floor coverings thoroughly.
 - 3. Damp-mop floor coverings to remove marks and soil.
- C. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor covering before applying liquid floor polish.
 - 1. Apply three coat(s).
- E. Cover floor coverings until Substantial Completion.

END OF SECTION

SECTION 096517
RESILIENT SAFETY SHEET FLOORING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: This section includes labor, materials and other services necessary to complete resilient sheet flooring, slip resistant sheet vinyl safety flooring systems and accessories work. Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section.
- B. Related Sections:
 - 1. Section 03300 - Cast-in-Place Concrete: Concrete finishing.
 - 2. Division 7 - Thermal and Moisture Protection.
 - 3. Division 15 - Mechanical.

1.02 REFERENCES

- A. ASTM D 2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
- B. ASTM E 648/NFPA 253, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- C. ASTM E662, Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- D. ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- E. ASTM F 970, Standard Test Method for Static Load Limit.
- F. ASTM F1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring.
- G. ASTM F1303, Standard Specification for Sheet Vinyl Floor Covering with Backing.
- H. ASTM F2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- I. (RFCI) Resilient Floor Covering Institute
 - 1. RFCI Standard Slab Moisture Test Method (Calcium Chloride Method)

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's current printed product literature, specifications, installation instructions, and field reports in accordance with Section 01330 - Submittal Procedures.
- B. Shop Drawings: Submit shop drawings to indicate materials, details, and accessories in accordance with Section 01330 - Submittal Procedures including but limited to the following:
 - 1. Submit a cut diagram indicating seam locations and roll direction. Use mitered seam layouts for corners when changing directions 180 degrees (e.g. when running material down corridors which bisect at a right angle), unless approved otherwise.
- C. Samples: Submit duplicate 12" x 12" (300 mm x 300 mm) sample pieces of sheet material, 12" cap strip in accordance with Section 01330 - Submittal Procedures.

- D. Closeout Submittals: Submit the following:
 - 1. Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - 1. Training: Installer who has attended an Altro flooring installation training clinic.
- B. Regulatory Requirements: Provide slip resistant sheet vinyl safety flooring in compliance with the following:
 - 1. Local Jurisdiction of Health Department
 - 2. Americans with Disabilities Act Architectural Guidelines (ADAAG).
 - 3. Occupational Safety & Health Administration (OSHA).
- C. Mock-ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing.
 - 1. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 - 2. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.
- D. Pre-installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, manufacturer's warranty requirements, and installer qualifications.

1.05 SITE CONDITIONS

- A. Temperature Requirements: If storage temperature is below 65F (18C) or the floor temperature is below 50F (18C), Refer to Manufacturer's Installation Practices.
 - B. Maintain air temperature and structural base temperature at flooring installation area between 68F (20C) and 80F (26C) for 48 hours before, during and 24 hours after installation as required per manufacturer's requirements

1.06 WARRANTY

- A. Warranty period shall be 15 years commencing on date of substantial completion. Refer to conditions of the contract for project warranty provisions.

1.07 BACKING

- A. Non-woven polyester/cellulose, glass fiber reinforcement.

PART 2 PRODUCTS

2.01 SAFETY FLOORING

- A. Slip Resistant Sheet Vinyl Manufacturer:
 - a. Atlas 40 by Altro,
 - b. Or approved equal

COLORS

- 1. To be selected by manufacturer's full range

2.02 ACCESSORIES

- A. Vinyl welding rod: Acceptable material:
 - 1. Altro weld rod or approved equal
- B. Cove former: Acceptable material, sized to suit application:
 - 1. Minimum 3/8" radius
- C. Gulley edge: Acceptable material, vinyl, sized to suit application:
- D. Cap strip: Acceptable material, sized to suit application, stainless steel.
- E. Subfloor Filler and Leveler: Use only gray Portland cement-based "moisture tolerant" underlayments, and patching compounds. Use for filling cracks, holes or leveling. White gypsum materials are not acceptable.
- F. Metal edge strips:
 - 1. Aluminum extruded, smooth, [mill finish] stainless steel with lip to extend over flooring.
- G. Adhesives
 - 3. 2 part polyurethane for areas prone to moisture

PART 3 EXECUTION

3.01 EXAMINATION

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog, installation instructions.
- B. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.02 PREPARATION

- A. Safety flooring shall be installed over subfloors conforming to ASTM F710 for concrete and other monolithic floors or ASTM F1482 for wood subfloors.
- B. Always conduct moisture tests per ASTM F-2170 on all concrete slabs regardless of age or grade level. ASTM F-2170 Relative Humidity (RH) test results must not exceed 90%.
- C. Do not proceed with work until results of moisture condition tests are acceptable.
- D. When patching, a *moisture tolerant* patching compound must always be used.

3.03 INSTALLATION

- A. Flooring Installation: Install safety flooring in accordance with the manufacturer
- B. Coved Installation: Where Altro safety flooring is coved up wall surfaces and other abutments, installation shall be in accordance with Manufacturer's Installation Practices using the following accessories:
 - 1. Top set cove base: Install in accordance with manufacturer's instructions.

3.04 CLEANING

Specifier Note: Altro safety flooring is unaffected by surface water and most chemicals which do not have a solvent action on vinyl. Certain organic solvents and chemicals, including asphalt, can cause staining. Acids and dyes may affect the color, which should be selected accordingly.

- A. Cleaning: Remove temporary coverings and protection of adjacent work areas.
 - 1. Repair or replace damaged installed products.
 - 2. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- B. Protection:
 - 1. Sweep or vacuum all construction debris and dust first, then clean the flooring with using an auto scrubber.

3.05 PROTECTION

- A. Cover and protect finished installation from damage from other trades using a non-staining, temporary floor protection system, such as a reusable textured plastic sheeting.
- B. Flooring should be covered and protected from all other trades during construction with a suitable non-staining protective covering without taping to the surface of the flooring.

----- END OF SECTION -----

SECTION 096519
RESILIENT LUXURY 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. Floating Resilient luxury vinyl composition floor tile.

- B. RELATED SECTIONS:

- 1. Division 03 Section "Topical Concrete Vapor Control Barrier" for vapor control barrier above concrete subfloor.
 - 2. Division 06 Section "Interior Architectural Woodwork" for wood base installed with resilient floor coverings.
 - 3. Division 09 Section "Flooring Moisture and Alkalinity Testing" for testing in preparation of flooring.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Samples for Initial Selection: For each type of floor tile indicated.
- D. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- E. Product Schedule: For floor tile. Use same designations indicated on Drawings.
- F. Qualification Data: For qualified Installer.
- G. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer certified by the flooring manufacturer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.
- B. 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.

1.5 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 70 deg F. Store floor tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 68 deg F or more than 85 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. 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.

1.7 WARRANTY

- A. Special Warranty for Wear: Manufacturer's standard form in which manufacturer agrees to repair or replace materials showing excessive wear within specified warranty period.
 - 1. Warranty does not include deterioration or failure due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUXURY VINYL TILE FLOORING

- A. Basis-of-Design Product: See drawings for locations. Subject to compliance with requirements, design is based on the following product:

1. TYPE A: Patcraft, Mixed Materials Coverage

- a. Size: 9 x 36 inches nominal.
- b. Thickness: 0.2 inches.
- c. Surface Profile: Metallix.
- d. Wear Layer: 40 mil.
- e. Finish: UV Urethane
- f. Installation: full spread.
- g. Product must have an enhanced urethane wear layer.
- h. Complies with ASTM F 1700, Class III, Type B (Embossed).
- i. Resistance to Chemicals: ASTM F 925, meets standard.
- j. Light Stability: ASTM F 1515, Excellent.
- k. Critical Radiant Flux: Less than 0.45.
- l. Smoke Development: ASTM E 662, Class 1.
- m. Style: I337V
- n. Color and Pattern: Titanium 00780

2. TYPE B: Patcraft, Mixed Materials Coverage

- a. Size: 9 x 36 inches nominal.
- b. Thickness: 0.2 inches.
- c. Surface Profile: Wood Planx.
- d. Wear Layer: 40 mil.
- e. Finish: UV Urethane
- f. Installation: full spread.
- g. Product must have an enhanced urethane wear layer.
- h. Complies with ASTM F 1700, Class III, Type B (Embossed).
- i. Resistance to Chemicals: ASTM F 925, meets standard.
- j. Light Stability: ASTM F 1515, Excellent.
- k. Critical Radiant Flux: Less than 0.45.
- l. Smoke Development: ASTM E 662, Class 1.
- m. Style: I336V
- n. Color and Pattern: Sand Oak 00140

3. TYPE C: Patcraft, Mixed Materials Coverage

- a. Size: 9 x 36 inches nominal.
- b. Thickness: 0.2 inches.
- c. Surface Profile: Wood Planx.
- d. Wear Layer: 40 mil.
- e. Finish: UV Urethane
- f. Installation: full spread.
- g. Product must have an enhanced urethane wear layer.

- h. Complies with ASTM F 1700, Class III, Type B (Embossed).
 - i. Resistance to Chemicals: ASTM F 925, meets standard.
 - j. Light Stability: ASTM F 1515, Excellent.
 - k. Critical Radiant Flux: Less than 0.45.
 - l. Smoke Development: ASTM E 662, Class 1.
 - m. Style: I336V
 - n. Color and Pattern: Blonde Cherry 00250
4. TYPE D: Shaw Contract, Natural Choreography
- a. Size: 18 x 18 inches nominal.
 - b. Thickness: 0.2 inches.
 - c. Surface Profile: Wood Planx.
 - d. Wear Layer: 40 mil.
 - e. Finish: UV Urethane
 - f. Installation: full spread.
 - g. Product must have an enhanced urethane wear layer.
 - h. Complies with ASTM F 1700, Class III, Type B (Embossed).
 - i. Resistance to Chemicals: ASTM F 925, meets standard.
 - j. Light Stability: ASTM F 1515, Excellent.
 - k. Critical Radiant Flux: Less than 0.45.
 - l. Smoke Development: ASTM E 662, Class 1.
 - m. Style: Cut 0922V
 - n. Color and Pattern: Honey 22280
5. Provide product indicated or a comparable product subject to Request for Substitution.

2.2 INSTALLATION MATERIALS

- A. Perimeter glue only per flooring manufacturer's recommendations for application indicated.
- B. Adhesives: Manufacturer's proprietary spray adhesive for specified floor products.
 - 1. Basis of Design Product: Approved per manufacture.

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.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

- C. 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.
 - 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. Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing. Use specified flooring products and adhesive for test.
 - 4. Alkalinity Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing. Alkalinity level shall be less than a pH of 12.
 - 5. Moisture Testing: Perform anhydrous calcium chloride test, 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.
- 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 flooring products and substrates 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. Lay tiles in pattern(s) indicated.
- 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.

- 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, 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 nonpermanent, nonstaining marking device.
- G. Adhere floor tiles to flooring substrates using manufacturer's proprietary adhesive and in accordance with manufacturer's written installation instructions.

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 marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: If recommended in writing by flooring manufacturer, polish floors in accordance with manufacturer's recommendations.
 - 1. Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
- E. Cover floor tile to protect from damage until Substantial Completion.
- F. Maintain ambient temperatures indicated in Part 2 Article "Project Conditions" until Substantial Completion.

END OF SECTION

SECTION 096723
RESINOUS 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. Urethane mortar system with seamless coved base.
 - 2. Urethane floor system with urethane-urea resin coating.

- B. Related Sections:

- 1. Division 03 Section "Cast-Place Concrete."
 - 2. Division 07 Section "Joint Sealants."
 - 3. Division 09 Section "Floor Moisture and Alkalinity Testing."
 - 4. Division 22 Section(s) as applicable to floor drains and clean outs.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
 - 1. Include statement of VOC content for coatings, adhesives, and sealants.
- C. Shop Drawings: Include installation requirements. Include plans, elevations, sections, component details, and attachments to other work.
- D. Samples for Initial Selection: Manufacturer's color plates showing the full range of colors and patterns available for each flooring type indicated.
- E. Samples for Verification: For each resinous flooring system required, 6 inches (150 mm) square, applied to a rigid backing by Installer for this Project.
 - 1. Submit 2-1/2" x 4" sample of color chips from color chart selection designated by the Architect.
- F. Qualification Data: For installer.

- G. Material Certificates: Signed by manufacturers certifying that the flooring complies with requirements specified herein.
- H. Maintenance Data: Submit manufacturer's written instructions for recommended maintenance practices.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are trained and certified by floor system manufacturer for installation techniques required for work of this Project.
- B. Source Limitations: Obtain all resinous materials, including primers, resins, hardening agents, colored aggregates and finish or sealing coats, from a single manufacturer.
- C. No request for substitution shall be considered that would change the generic type of floor system specified. Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer.
- D. Slip Resistance: Installed floor systems shall have a minimum static coefficient of friction of 0.7 for level surfaces as determined by testing per ASTM D 2047.
- E. USDA: Compliant or approved flooring system.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in in factory sealed containers, showing manufacturer's name, material and name, and lot number.
- B. Store materials indoors protected from weather, moisture, and damage, in accordance with manufacturer's written instructions.
- C. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 85 deg F, with relative humidity of less than 50 percent for 48 hours prior to, during and after installation.
- B. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring installation.
- C. Close spaces to traffic during application and for 72 hours (70 Deg. F) after final application. Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

1. Provide dustproof partitions and temporary enclosures to limit dust migration and to isolate areas from noise.
- D. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

1.7 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of (1) full years from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of (1) full year from date of installation. A sample warranty letter must be included with bid package.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING

- A. Description: Self-leveling, urethane mortar system..
- B. Basis-of-Design: Drawings and Specifications are based on the following:
 1. Stonhard, Inc.; Stontec.
 - a. Subject to compliance with requirements, provide product indicated or a comparable product subject to Request for Substitution.
- C. System Characteristics:
 1. Color and Pattern: **Diablo Beige, White Platinum, refer to Finish Schedule**
 2. Wearing Surface: Smooth texture.
 3. Integral Cove Base: 6" inches.
 4. Resin: Urethane.
 5. Formulation Description: (4) four-component, 100 percent solids.
 6. Application Method: Screed, Trowel.
 - a. Thickness of Coats: 1/4".
 - b. Number of Coats: One.
 - c. Broadcast texture into wet mortar base.
 7. Aggregates:
 - a. Texture #1 (All Locations except Kitchen)
 - b. Texture #2 (Kitchen)
- D. Physical Properties:
 1. Applied Thickness: 3/16 to 1/4-inch, nominal.
 2. Abrasion Resistance: 0.03 g weight loss, ASTM D 4060, CS-17 Wheel, 1,000 cycles.

3. Surface Hardness: up to 80-84, ASTM D 2240, Shore D.
 4. Tensile Strength: 1,000 psi per ASTM C 307.
 5. Compressive Strength: 7,700 psi (7 days) per ASTM C 579.
 6. Flexural Strength: 2,400 psi per ASTM C 580.
 7. Water Absorption: <1% per ASTM C 413.
 8. Adhesion: 350 psi with 100% concrete failure per ASTM D7234 (dependent of tensile strength of concrete)
 9. Impact Resistance: > 160 in. lbs. per ASTM D 2794.
 10. Optimum Service Temperature: -40 Deg. F to 212 Deg. F. (continuous)
 11. Mold Growth: Rated 10 (highest resistant) per ASTM D 3273.
 12. Relative Humidity: tolerant to 100% per ASTM D2170
 13. Alkalinity: Resistant to 14pH substrate levels
 14. Flammability: Class 1 per ASTM E-8.
- E. Finish Coat: Cleanable, 100% solids, seamless, impermeable, solvent-free polyaspartic, quick-curing UV resistant finish coat.
1. Material Design Basis: Stonkote HT4.
 2. Resin: Epoxy.
 3. Formulation Description: (2) two-component, 100 percent solids.
 4. Type: Pigmented.
 5. Finish: Standard.
 6. Number of Coats: One.
 7. Hardness: 80-84 shore D per ASTM D2240.
 8. USDA: Meets requirements.
 9. FDA: Meets food code requirements.
 10. Cleanability: 100% using manufacturer recommend solutions.
- F. Static coefficient of Friction: Minimum result of 0.70 per ASTM D 2047 or based on Owners desired friction.

2.2 ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Manufacturers approved materials.
- B. Primer: Manufacturers primer as required by site conditions.
 1. Use products that have a VOC content of not more than 90 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated.
- D. Temporary Floor Protection: Water and stain resistant sheeting with vapor preamable technology.
- E. Waterproofing Membrane: Manufacturers approved materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Remove contaminants and mechanically clean substrates to an ICRI Guideline 03732, CSP 5 profile using dust free hydroblasting system.
 - 1. Mechanically prepare substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
 - b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
- C. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 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. Moisture, Alkalinity, and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - a. Moisture and alkalinity testing shall be performed in accordance with Division 09 Section "Flooring Moisture and Alkalinity Testing."
 - 1) Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
 - 2) Test above provides a more accurate indication as to whether or not a concrete slab has dried sufficiently to allow finish flooring application than the tests below.

- 3) For applying impermeable resinous flooring systems, 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab in 24 hours is generally considered a safe moisture-vapor-emission rate. Consult manufacturers for appropriate rates for permeable systems that will allow moisture vapor to continue through them once cured.
 - 4) Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate as follows:
 - a) Stoneclad: 7 lb of water/1000 sq. ft. of slab in 24 hours.
 - b) Stoneres: 3 lb of water/1000 sq. ft. of slab in 24 hours.
 - 5) Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.
4. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- E. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
1. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. 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.

3.3 RESINOUS FLOORING INSTALLATION

- A. General: Apply each component of according to manufacturer's written installation instructions to produce a uniform monolithic flooring surface of thickness indicated and slip resistance required for spaces.
1. Follow slope to drain requirements using manufacturers recommended materials and details.
 2. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 3. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 4. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.

- C. All outside edges not terminating near a wall or curb must be keyed to avoid featheredges in accordance with manufacturer recommendations.
- D. All through-floor penetrations, lap and seal the flooring system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.
- E. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.
- F. Floor Drains: Treat floor drains by chasing the flooring system to lock in place at point of termination.
- G. Cove Base: Apply coved base mix to primed wall surface to a height of 6 inches unless otherwise indicated, follow manufacturer's instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of coved base. Apply cove base mix to wall surfaces before applying flooring.
- H. Mortar Base Coat: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate at manufacturer's recommended height using specially designed trowel and or Screed box. Broadcast desired light texture directly into mortar base. Field verify texture needed
- I. Finish Coat: Apply two-coats, following manufacturer's recommendations.
- J. Joints and Cracks
 - 1. Treat control joints to bridge potential cracks and to maintain monolithic protection.
 - 2. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
 - 3. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.
- K. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor system.
- B. Remove grinding dust from installation and adjacent areas. Wash surfaces with cleaner according to and manufacturer's written instructions; rinse surfaces with water and allow to dry thoroughly.

- C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that resinous flooring is without damage or deterioration at time of Substantial Completion.
- D. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

SECTION 096816
CARPETING

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. Tufted carpet.
- B. Related Sections include the following:
 - 1. Division 03 Section "Topical Concrete Vapor Control Barrier."
 - 2. Division 06 "Interior Architectural Woodwork" for wood wall base installation.
 - 3. Division 09 Section "Flooring Moisture and pH Testing."
 - 4. Division 09 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:
 - 1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - 2. Carpet type, color, and dye lot.
 - 3. Locations where dye lot changes occur.
 - 4. Seam locations, types, and methods.
 - 5. Type of subfloor.
 - 6. Type of installation.
 - 7. Pattern type, repeat size, location, direction, and starting point.
 - 8. Pile direction.
 - 9. Type, color, and location of insets and borders.
 - 10. Type, color, and location of edge, transition, and other accessory strips.
 - 11. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch long Samples.
 3. Carpet Seam: 6-inch Sample.
 4. Mitered Carpet Border Seam: 12-inch square Sample. Show carpet pattern alignment.
- D. Product Schedule: For carpet and carpet cushion. Use same designations indicated on Drawings.
- E. Qualification Data: For Installer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.
- G. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet, 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 and carpet cushion.
- H. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed carpet installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.
1. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet and over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.7 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Basis of Design:
 - a. **CPT-A**
 - 1) Manufacturer: Shaw Contract, Light Series
 - 2) Style: Visible Tile 5T002
 - 3) Color: Equinox - 01760
 - 4) Fiber Type: Colorstrand Nylon
 - 5) Pile Characteristic: Tufted Textured Loop
 - 6) Pile Thickness: 0.098"
 - 7) Size: 24" X 24"
 - 8) Installation Method: Non Directional
 - b. **CPT-B**
 - 1) Manufacturer: Atlas La Dolce Vita Collection
 - 2) Style: Ciambella
 - 3) Color: Tavern Creek CB-21
 - 4) Fiber Type: Colorstrand Nylon
 - 5) Pile Characteristic: Tufted Textured Loop
 - 6) Density: 5,760

- 7) Pile Thickness: 0.16"
- 8) Size: Roll
- 9) Installation Method: Standard

c. CPT-C

- 1) Manufacturer: Interface
- 2) Style: Step Repeat SR899
- 3) Color: 104919 Khaki
- 4) Fiber Type: Colorstrand Nylon
- 5) Pile Characteristic: Tufted Textured Loop
- 6) Pile Thickness: 0.098"
- 7) Size: 19.69" X 19.69"
- 8) Installation Method: Non Directional

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.
- C. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:
 - 1. Adhesive Tab for Modular Carpet.
 - 2. Adhesive Bed for Roll Carpet
- B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - 1. Level adjoining border edges.
- C. Do not bridge building expansion joints with carpet.
- D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.

- 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet 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 manufacturer and carpet adhesive manufacturer.

END OF SECTION

SECTION 09 84 33
SOUND-ABSORBING WALL UNITS

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 shop-fabricated, acoustical panel units tested for acoustical performance, including the following:
 - 1. Sound-absorbing wall panels.

1.3 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include fabric facing, panel edge, core material, and mounting indicated.
- B. Shop Drawings: For unit assembly and installation.
 - 1. Include plans, elevations, sections, and mounting devices and details.
 - 2. Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
 - 3. Include details at cutouts and penetrations for other work.
 - 4. Include direction of fabric weave and pattern matching.
- C. Samples for Verification: For the following products:

1. Fabric: Full-width by approximately 36-inch long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
2. Panel Edge: 12-inch long Sample(s) showing each edge profile, corner, and finish.
3. Core Material: 12-inch square Sample at corner.
4. Mounting Devices: Full-size Samples.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Electrical outlets, switches, and thermostats.
 2. Items penetrating or covered by units including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Alarms.
 - e. Sprinklers.
 - f. Access panels.
- B. Product Certificates: For each type of unit.
- C. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fabric: For each fabric, color, and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 sq. yd., full width of bolt.
 2. Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than five devices, including unopened adhesives.

1.9 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials, fabrication, and installation.
 - 1. Build mockup of typical wall area 48 inches wide by full height.
 - 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.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install units until a lighting level of not less than 50 fc is provided on surfaces to receive the units.
- C. Air-Quality Limitations: Protect units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to the following:
 - a. Acoustical performance.
 - b. Fabric sagging, distorting, or releasing from panel edge.
 - c. Warping of core.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wall units specified in this Section from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a 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. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.3 SOUND-ABSORBING WALL UNITS

- A. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed core and bonded or attached to edges and back of frame
- B. Basis of Design: Acoustech, Inc. 1-1/2" Standard Absorption Wall
 1. Approved Equal
 2. Panel Shape: Flat
 3. Mounting: Edge mounted with splines secured to substrate.
 - a. Finish Color at Exposed Edges: Match color of facing material
 4. Mounting: Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.

2.4 MATERIALS

- A. Core Materials: Manufacturer's standard.

1. Medium-Density Fiberboard: Panels complying with ANSI A208.2.
 - a. Fire-retardant panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E84 or UL 723.
- B. Facing Material: Fabric from same dye lot; color and pattern as selected by Architect from manufacturer's full range
- C. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit

2.5 FABRICATION

- A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- B. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, or sags.
- C. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
 1. Square Corners: Tailor corners.
 2. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.
 3. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent units.
- D. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
 1. Thickness.
 2. Edge straightness.
 3. Overall length and width.
 4. Squareness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation tolerances, and other conditions affecting unit performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch noncumulative.
- B. Variation of Joint Width: Not more than 1/16-inch.

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

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 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.

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, switches, 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. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product. Include preparation requirements and application instructions.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
- D. 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.
- E. Product List: For each product indicated, include the following:
 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 2. VOC content.

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 SCHEDULED PAINT SYSTEMS

- A. Provide paint systems as scheduled 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.
 - 1) Subject to compliance with requirements, provide the named products or comparable products by one of the following:
 - a) Dunn-Edwards Paints.
 - b) Fuller O'Brien Paints.
 - c) ICI Paints.
 - d) Benjamin Moore & Co.
 - e) PPG Industries.
 - f) Tnemec.

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: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: Provide color selections made by the Architect. Colors to be factory mixed and to match approved samples.
- E. Mixing:
 - 1. Follow manufacturer's printed recommendations.
 - 2. Mix all paints thoroughly prior to application.
 - 3. Mix only in Inspector's presence in assigned spaces.
 - 4. Except where thinning is specifically recommended by manufacturer, do not thin products.

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, switches, or control devices unless otherwise indicated on Electrical Drawings.
 - a. Contractor may be subject to additional costs due to unauthorized removal of items, refer to Part 1 Article "Special Requirements."

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 to be painted 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: Clean ungalvanized steel surfaces that have not been shop-primed; remove oil, grease, dirt, rust, loose mill scale, and other foreign substances. 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."
 2. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- 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: Clean galvanized substrates with nonpetroleum-based solvents to remove oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods. Prepare surface 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. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.
- M. 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 gypsum board and plaster trim.
- 3) Acoustical wall panels.
- 4) Toilet and urinal partitions.
- 5) Stainless steel items.
- 6) Finished mechanical and electrical equipment.
- 7) Light fixtures.
- 8) Distribution cabinets.

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. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
 - C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
 - D. 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.
 - E. 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.
- F. 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.
- G. 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.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. 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.
- J. 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.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even 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. Unless otherwise noted.**
- L. 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.

- M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- N. 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. 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.
 - h. Ducts, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - 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

- A. Interior and exterior paint systems shall be as indicated on the following pages.

B. Interior Paint Systems:

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
(1)	Gypsum Drywall	P12.A	Flat, Latex	First Coat Second Coat Third Coat	B28 B30 B30	ProMar 200 Zero Primer ProMar 200 Zero ProMar 200 Zero
		P12.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	B28 B31 B31	ProMar 200 Zero Primer ProMar 200 Zero ProMar 200 Zero
		P12.C	Eggshell Enamel Latex	First Coat Second Coat Third Coat	B28 B41 B41	ProMar 200 Zero Primer ProMar 200 Zero ProMar 200 Zero
	(Textured)	P12.D	Flat	One Coat	A44	Tuff Surface
(2)	Wood	P13.A	Semi-Gloss Latex		B28 B31 B31	Premium Wall & Wood Primer ProMar 200 Zero ProMar 200 Zero
		P13.B	Eggshell Enamel, Latex	First Coat Second Coat Third Coat	B28 A75 A75	Premium Wall & Wood Primer Solo EG Solo EG
		P13.C	Varnish Satin	Stain First Coat Second Coat Third Coat		Minwax Wood Stain WoodClassics Satin Varnish WoodClassics Satin Varnish WoodClassics Satin Varnish
		P13.D	Varnish Semi-Gloss	Stain First Coat Second Coat Third Coat		Minwax Wood Stain Helmsman SG Helmsman SG Helmsman SG
(3)	Ferrous Metal	P14.A	Flat Latex	First Coat Second Coat Third Coat t	B66 B30 B30	ProCryl ProMar 200 Zero ProMar 200 Zero
		P14.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	B66 A77 A77	ProCryl Solo SG Solo SG
		P14.C	Eggshell Latex	First Coat Second Coat Third Coat	B66 B20 B20	ProCryl ProMar 200 Zero ProMar 200 Zero
(4)	Galvanized Metal/ Aluminum	P15.A	Flat Latex	First Coat Second Coat Third Coat	B66 B30 B30	ProCryl ProMar 200 Zero ProMar 200 Zero
		P15.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	B66 A77 A77	ProCryl Solo SG Solo SG
		P15.C	Eggshell Latex	First Coat Second Coat	B66 B41	ProCryl ProMar 200 Zero

SURFACE		PAINT SYSTEM		COATS	MANUFACTURER'S DESIGNATION	
				Third Coat	B41	ProMar 200 Zero
(5)	Plaster, Concrete, Brick, Stucco	P16.A	Flat Latex	First Coat Second Coat Third Coat	A24 B30 B30	Loxon ProMar 200 Zero ProMar 200 Zero
		P16.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	A24 A77 A77	Loxon Solo SG Solo SG
		P16.C	Eggshell Latex	First Coat Second Coat Third Coat	168 B41 B41	Prime Plus ProMar 200 Zero ProMar 200 Zero
(6)	Concrete Block	P17.A	Flat latex	First Coat Second Coat Third Coat	B25 B30 B30	PrepRite Block Filler ProMar 200 Zero ProMar 200 Zero
		P17.B	Semi-Gloss Latex	First Coat Second Coat Third Coat	B25 A77 A77	PrepRite Block Filler Solo SG Solo SG
		P17.C	Eggshell Latex	First Coat Second Coat Third Coat	262 B41 B41	PrepRite Block Filler ProMar 200 Zero ProMar 200 Zero
(7)	Acoustical Ceiling Tile/ Plaster	P18.A	Latex	One Coat to Cover	A21	Eco Select
(8)	Ceiling and Wall w/misc. Pipes & Conduit, attached and Trusses & Beams w/Spray- on Fire Insulation	P20.A		One Coat	B42	Waterbased Dryfall White or Black

C. Exterior Paint Systems:

SURFACE		FINISH SCHEDULE DESIGNATION		COATS	MANUFACTURER'S DESIGNATION	
(1)	Plaster, Concrete	P50.A	Flat, Acrylic	First Coat Second Coat Third Coat	B51 A06 A06	MP (Multi Purpose) Latex Primer A-100 A-100
		P50.B	Low Sheen Enamel Acrylic	First Coat Second Coat Third Coat	B51 A75 A75	MP Latex Primer Solo EG Solo EG
(2)	Concrete Block Masonry	P51.A	Flat, acrylic emulsion	First Coat Second Coat Third Coat	262 A06 A06	Block Filler A-100 A-100
		P51.E	Clear Water Repellent 10-yr Warranty	1 Coat	SX-7	H&C Clear Water Repellent
(3)	Wood	P53.A	Flat Acrylic Emulsion	First Coat Second Coat Third Coat	B51 A06 A06	MP Latex Primer A-100 A-100
		P53.B	Semi-Gloss Acrylic	First Coat Second Coat Third Coat	B51 A77 A77	MP Latex Primer Solo SG Solo SG
		P53.C	Low Sheen Enamel Acrylic	First Coat Second Coat Third Coat	B51 A75 A75	MP Latex Primer Solo EG Solo EG
(3)	Wood	P53.D	Flat, Stain Water Base Semi-Transparent	First Coat Second Coat		Woodscapes Woodscapes
		P53.E	Flat, Stain Opaque	First Coat Second Coat		Decksapes Decksapes
		P53.F	Varnish Clear Gloss	First Coat Second Coat Third Coat	6509 6509 6509	WoodClassics Varnish WoodClassics Varnish WoodClassics Varnish
		P53.G	Stain and Varnish	First Coat Second Coat Third Coat	6509 6509	Woodscapes Stain WoodClassics Varnish WoodClassics Varnish
(4)	Ferrous Metal	P55.D	Gloss High Perform..	First Coat Second Coat Third Coat	B66 B65 B65	ProCryl Primer HS Polyurethane Gloss HS Polyurethane Gloss
		P55.E	Semi-Gloss High Perform.	First Coat Second Coat Third Coat	B66 B65 B65	ProCryl Primer HS Polyurethane SG HS Polyurethane SG

SURFACE		FINISH SCHEDULE DESIGNATION		COATS	MANUFACTURER'S DESIGNATION	
(5)	Galvanized Metal & Aluminum	P56.C	Gloss High Perform.	First Coat Second Coat Third Coat	B66 B65 B65	ProCryl Primer HS Polyurethane Gloss HS Polyurethane Gloss
		P56.D	Semi-Gloss High Perform.	First Coat Second Coat Third Coat	B66 B65 B65	ProCryl Primer HS Polyurethane SG HS Polyurethane SG
		P56.E	Gloss	First Coat Second Coat Third Coat	B66 A77 A77	ProCryl Primer Solo GL Solo GL
(6)	Aluminum	P58.A	Flat, Acrylic	First Coat Second Coat Third Coat	B66 A06 A06	DTM Primer A-100 A-100
		P58.B	Semi-Gloss Enamel Acrylic	First Coat Second Coat Third Coat	B66 A75 A75	DTM Primer Solo SG Solo SG

END OF SECTION

SECTION 10 11 00
VISUAL DISPLAY SURFACES

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. Porcelain enamel marker boards; factory assembled with aluminum trim.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Include sections of typical trim members.
- D. Schedule: Provide schedule including types, locations, sizes, mounting heights, and other data pertinent to installation.
- E. Samples for Verification: For each type of visual display surface indicated and as follows:
 - 1. Visual Display Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim and Rails: 6-inch long sections of each profile.
 - 3. Accessories: Full-size Sample of each type of accessory.
- F. Maintenance Data: For visual display surfaces to include in maintenance manuals.
- G. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.

- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display surfaces and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-built visual display boards, including factory-applied trim, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.
- B. Store visual display units vertically with packing materials between each unit. Do not store flat or stacked.

1.6 COORDINATION

- A. Coordinate blocking and backing for wall anchorage of marker boards with wall framing.

1.7 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces become slick or shiny.
 - c. Surfaces exhibit crazing, cracking, or flaking.
 - 2. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Porcelain-Enamel Face Sheet: Manufacturer's standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness indicated; gloss finish, dry-erase markers wipe clean with dry cloth or standard eraser.
 - 1. PEI-1002, with face sheet manufacturer's standard two- or three-coat process.
- B. Particleboard: ANSI A208.1, Grade 1-M-1.
- C. Cork Sheet: MS MIL-C-15116-C, Type II.

- D. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

2.2 MARKERBOARD ASSEMBLIES

- A. Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and 0.021-inch (24 gage) thick, porcelain-enamel face sheet with high gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - a. Best-Rite Manufacturing.
 - b. Claridge Products & Equipment, Inc.
 - c. Platinum Visual Systems; a division of ABC School Equipment, Inc.
 - d. PolyVision Corporation.
 2. Core: Particleboard, 1/2 inch thick.
 3. Backing Sheet: Aluminum foil, manufacturer's standard thickness, not less than 0.005 inches thick.
 4. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
 5. Size: Sizes as indicated on drawings with single units available in sizes up to 4 feet high by 16 feet long without joints or splicing.

2.3 ACCESSORIES

- A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch thick, extruded aluminum; of size and shape indicated, with clear anodized satin finish.
1. Factory-Applied Trim: Manufacturer's standard.
- B. Chalktray: Manufacturer's standard, continuous solid type extruded aluminum chalk tray with ribbed section and smoothly curved exposed ends.
- C. Map Rail: Provide the following accessories: Confirm if you want a Map Rail
1. Display Rail: Continuous and integral with map rail; fabricated from cork approximately 1 to 2 inches wide.
 2. End Stops: Located at each end of map rail.
 3. Map Hooks with Clips: Two map hooks with flexible metal clips for every 48 inches of map rail or fraction thereof.

2.4 FABRICATION

- A. Porcelain-Enamel Visual Display Boards: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

- B. Factory Assembled Marker Boards: Factory assemble visual display boards and trim at manufacturer's factory before shipment unless otherwise indicated.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, with joints located as acceptable to Architect and as indicated on approved Shop Drawings.
 - 2. Provide manufacturer's standard vertical-joint spline system between abutting sections of markerboards.
- C. Aluminum Frames and Trim: Fabricate units straight and of single lengths, miter corners to form neat, hairline joints.

2.5 ALUMINUM 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. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- D. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.
- B. Examine walls and partitions for proper backing for visual display surfaces.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instruction for surface preparation.
- B. Remove dirt, projections, and depressions that will affect smooth, finished surfaces of visual display boards.

3.3 INSTALLATION OF MARKER BOARDS

- A. General: Install marker boards in locations and at mounting heights indicated on Drawings. Install with perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, brackets, anchors, trim, and accessories necessary for complete installation.
 - 1. Fasten marker boards to walls as detailed on the Drawings using concealed clips, hangers, and grounds attached to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

3.4 CLEANING AND PROTECTION

- A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION

SECTION 10 14 00
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.
- B. Related Sections:
 - 1. Division 22, 23, and 26 Sections as applicable to Plumbing, Mechanical, and Electrical Work for tags and nameplates.

1.3 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 REGULATORY REQUIREMENTS

- A. Regulatory Requirements: Comply with the California Building Code, Title 24, The Americans with Disabilities Act (ADA), and ANSI A117.1.
 - 1. Visual Characters (CBC 11B-703.5): Comply with the following:
 - a. Sign Finish and Contrast (CBC 11B-703.5.1): Characters, symbols, and their background shall have a non-glare finish. Characters and symbols shall contrast with their background, either light on dark background or dark on light background.
 - b. Character (Text) Style (CBC 11B-703.5.3): Character shall be convention in form. Character shall not be italic, oblique, script, highly decorative, or of other unusual forms.
 - c. Character (Text) Proportions (CBC 11B-703.5.4): Characters 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 upper case letter "T".

- d. Character (Text) Height (CBC 11B-703.5.5): Minimum character height shall comply with Table 11B-703.5.5. Viewing distance shall be measured as the horizontal distance between the character and an obstruction preventing further approaching towards the sign. Character height shall be based on the upper letter "I".
- e. Character (Text) Stroke Thickness (CBC 11B-703.5.7): Stroke thickness of the uppercase letter "I" shall be 10 percent minimum and 20 percent maximum of the height of the character.
- f. Character (Text) Spacing (CBC 11B-703.5.8): Character spacing shall be measured between the two closest points of adjacent characters, excluding word spaces. Spacing between individual characters shall be 10 percent minimum and 35 percent maximum of character height.
- g. Character (Text) Line Spacing (CBC 11B-703.5.9): Spacing between the baselines of separated lines of characters within a message shall be 135 percent minimum and 170 percent maximum of the character height.
- h. Character (Text) Format (CBC 11B-703.5.10): Text shall be in a horizontal format.

2. Raised Characters (CBC 11B-703.2): Comply with the following:

- a. Character Depth (CBC 11B-703.2.1): Raised character shall be 1/32 inch (0.8mm) minimum above their background.
- b. Character Case (CBC 11B-703.2.2): Characters shall be uppercase.
- c. Character Style (CBC 11B-703.2.3): Characters shall be sans serif. Characters shall not be italic, oblique, script, highly decorative, or of other unusual forms.
- d. Character Proportions (CBC 11B-703.2.4): Characters 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 upper case letter "T".
- e. Character Height (CBC 11B-703.2.5): Characters height measured vertically from the baseline of the character shall be a minimum of 5/8-inch and a maximum of 2-inches high based on the height of the uppercase letter "I".
- f. Character Stroke Thickness (CBC 11B-703.2.6): Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character.
- g. Character Spacing (CBC 11B-703.2.7): Character spacing shall be measured between the two closest points of adjacent characters within a message, excluding word spaces. Where characters have a rectangular cross sections, spacing between individual raised characters shall be 1/8 inch (3.2mm) 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 (1.6mm) minimum and 4 times the raised character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch (9.5mm) minimum.
- h. Character Line Spacing (CBC 11B-703.2.8): Spacing between the baselines of separated lines of characters within a message shall be 135 percent minimum and 170 percent maximum of the character height.

- i. Character (Text) Format (CBC 11B-703.2.9): Text shall be in a horizontal format.
- 3. Pictogram (CBC 11B-703.6): Comply with the following:
 - a. Pictogram Field (CBC 11B-703.6.1): Pictograms shall have a field height of 6 inches (152mm) minimum. Characters and Braille shall not be located in the pictogram field.
 - b. Pictogram Finish and Contrast (CBC 11B-703.6.2): Pictograms and their field shall have a non-glare finish. Pictogram shall contrast with their field with either a light pictogram on a dark field or a dark pictogram on a light field.
 - c. Text Descriptor (CBC 11B-703.6.3): Pictograms shall have a text descriptors located directly below the pictogram field. Text descriptor shall comply with Raised Character, Braille, and Mounting Location.
- 4. Braille (CBC 11B-703.3): Comply with the following:
 - a. Braille Type (CBC 11B-703.3): Braille shall be contracted (Grade 2).
 - b. Braille Dimension and Capitalization (CBC 11B-703.3.1): Braille dots shall have a domed or rounded shape. The indication of an uppercase letter or letters shall only be used before the first word of sentence, proper nouns and names, individual letters of the alphabet, initials, and acronyms.
 - c. Braille Position (CBC 11B-703.3.2): Braille shall be positioned below the corresponding text in a horizontal format, flush left of centered. If text is multi-lined, Braille shall be separated 3/8 inch (9.5mm) minimum and 1/2 inch (12.7mm) maximum from any other tactical characters and 3/8 inch (9.5mm) minimum from raised borders and decorative elements.
- 5. Installation Height and Location (CBC 11B-703.4): Signs with tactile characters and braille shall comply with the following:
 - a. Height above Finish Floor or Ground (CBC 11B-703.4.1): tactile character and braille on signs shall be located 48 inches (1219mm) minimum above the finish floor or ground surface, measured from the baseline of the lowest Braille cell and 60 inches (1524mm) maximum above the finish floor or ground surface, measured from the baseline of the highest line of raised characters.
 - b. Location (CBC 11B-703.4.2): Where a tactile sign is provided at a door, 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 leaves, the sign shall be located to the right hand door. Where there is not 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 (457mm) minimum by 18 inches (457mm) 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 permanent identification signage is provided for rooms and spaces they shall be located on the approach side of the door as one enters the

room or space. Signs that identify exits shall be located on the approach side of the door as one exits the room or space.

- c. Exception, Toilet Room Identification (CBC 11B-703.7.2.6): Doorways leading to toilet rooms and bathing rooms shall be identified by a geometric symbol. The symbol shall be mounted at 58 inches (1473mm) minimum and 60 inches (1524mm) maximum above the finish floor or ground surface measured from the centerline of the symbol. Where a door is provided the symbol shall be mounted within 1 inch (25mm) if the vertical centerline of the door.

1) Geometric door signage shall not contain Braille text.

- 6. International Symbol of Accessibility (ISA) (CBC 11B-703.7.2.1): The International Symbol of Accessibility (ISA) shall be the standard used to identify facilities that are accessible to and usable by persons with physical disabilities. Figure and proportions shall comply with CBC Figure 11B-703.7.2.1.

- a. Color of Symbol: The international Symbol of Accessibility shall consist of a white figure on a blue background; the blue shall be equal to Color No. 15090 in Federal Standard 595B. Alternate colors subject to approval by the governing agency.

1.5 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: Manufacturer's product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- C. 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.
- D. Schedule: Schedule indicating sign locations, type, other pertinent data, and referenced to rooms or doors with the same referencing as used on the Drawings.
- 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.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each sign type through one source from a single manufacturer.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.8 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 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. Best Sign Systems Inc.
 - a. Subject to compliance with requirements, provide the product indicated or a comparable products by one of the following:
 - 1) ASI-Modulex, Inc.
 - 2) Gemini Incorporated.

2.2 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 "Regulatory Requirements" Article in Part 1 of this Section.
- C. Scheduled Signs: Provide signs as indicated on Drawings and as scheduled in Part 3 Article "Sign Schedule."
- D. Interior Panel Signs: Basis of Design: Best Sign Systems, Inc., HC 300 Series signs complying with the following requirements:
 - 1. Material: Fiberglass Sheet, 0.25-inch thick.
 - 2. Edge Condition: Beveled.
 - 3. Corner Condition: Rounded to radius of 1/2 inch.
 - 4. Text Font: Helvetica Medium.
 - 5. Text Height: Refer to Drawing for size.
 - 6. Mounting: Unframed, wall mounted.
 - 7. Color: As selected by Architect from manufacturer's full range, text and border shall contrast with background.
- E. Exterior Panel Signs: Basis of Design: Best Sign Systems, Inc., HC 300 Series signs complying with the following requirements:
 - 1. Material: Fiberglass Sheet, 0.25-inch thick.
 - 2. Edge Condition: Beveled.
 - 3. Corner Condition: Rounded to radius of 1/2 inch.
 - 4. Text Font: Helvetica Medium.
 - 5. Text Height: Refer to Drawing for size.
 - 6. Mounting: Unframed, wall mounted.
 - 7. Color: As selected by Architect from manufacturer's full range, text and border shall contrast with background.

2.3 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 at heights indicated, with sign surfaces free from distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as pairs of doors, install signs on nearest adjacent wall. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door. Install wall signs centered 60-inches above the floor surface.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
 - 1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces that cannot be drilled or screwed. Do not use this method for vinyl-covered or rough surfaces.
 - 2. 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.
 - 3. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
 - 4. Where panel signs are mounted on glass, provide matching 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 ADA requirements.
 3. Sign Size: As indicated on drawings.
- B. Interior Tactile Exit Signs: Provide tactile exit signs to comply with regulatory requirements at the following locations:
1. As indicated on Drawings.
- C. Toilet Room Identification Signs: Signage shall consist of door and wall mounted signs to comply with regulatory requirements and as indicated on the Drawings.
- D. Exterior Identification Signs: Provide exterior identification signage at exterior public access doors to each usable or occupied space of the building.
1. Text Content: Identify building areas by functional use. Text content shall comply with Owner's instructions.
 2. Text Height: As indicated on Drawings and in compliance with ADA requirements.
 3. Sign Size: As indicated on drawings.
- E. Exterior International Symbol of Accessibility (ISA) Signs: Provide ISA signage at exterior public access entrances to each building.
1. Signs shall include an international symbol of accessibility graphic 5-inches square in size.

END OF SECTION

SECTION 101419
DIMENSIONAL LETTER 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. Cast dimensional characters.
 - 2. Cutout dimensional characters.
 - 3. Fabricated channel dimensional characters.
 - 4. Illuminated, fabricated channel dimensional characters.
 - 5. Molded-plastic dimensional characters.
 - 6. Illuminated, molded-plastic dimensional characters.

1.3 DEFINITIONS

- A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.4 COORDINATION

- A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.

- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Dimensional Characters: Full-size Sample of each type of dimensional character.
 - 2. Exposed Accessories: Full-size Sample of each accessory type.
 - 3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.
- E. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of dimensional character sign type(s) according to structural performance requirements.
- B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.
 1. Uniform Wind Load
 2. Concentrated Horizontal Load
 3. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: For exterior signage, allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F ambient; 180 deg F, material surfaces.
- D. 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.

2.2 DIMENSIONAL CHARACTERS

- A. Fabricated Channel Characters Metal face and side returns, formed free from warp and distortion; with uniform faces, sharp corners, and precisely formed lines and profiles; internally braced for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners; and as follows.
 1. Illuminated Characters: Backlighting character construction with LED lighting, including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.
 - a. Power: As indicated on electrical Drawings.
 - b. Weeps: Provide weep holes to drain water at lowest part of exterior characters. Equip weeps with permanent baffles to block light leakage without inhibiting drainage.
 2. Character Material: Sheet aluminum
 3. Material Thickness: Manufacturer's standard for size and design of character
 4. Character Height: As indicated on Drawings

5. Character Depth: As indicated on Drawings
6. Finishes:
 - a. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
7. Mounting: Manufacturer's standard for size and design of character
 - a. Hold characters at 2-inch distance from wall surface.
8. Typeface:
 - a. For Bidding purposes: Futura Bk
 - b. Final font to be determined by Owner.

2.3 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Aluminum Extrusions: ASTM B221 (ASTM B221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- D. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 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.
 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant spanner-head slots unless otherwise indicated.
4. Sign Mounting Fasteners:
 - a. 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.

- b. 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.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 - 6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 - 7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

2.6 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.

2.7 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. 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.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that electrical service is correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs 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. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. 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. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. 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.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs 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 10 21 13
TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Solid Color Reinforced Composite (SCRC) Substrate: (Bobrick SierraSeries).
 - 1. Toilet partitions.
 - 2. Urinal privacy screens.
 - 3. Dressing compartments.
 - 4. Shower dividers.

1.2 RELATED SECTIONS

- A. Division 06 - Rough Carpentry.
- B. Division 10 – Toilet Room Accessories

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Submit manufacturer's shop drawings for each product specified, including the following:
 - 1. Plans, elevations, details of construction and attachment to adjacent construction.
 - 2. Show anchorage locations and accessory items.
 - 3. Verify dimensions with field measurements prior to final production of toilet compartments.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 10 year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2 year experience installing similar products.
- C. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- D. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship is approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.5 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to starting work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- B. Handling: Handle materials to avoid damage.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 SEQUENCING

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: Bobrick Washroom Equipment, Inc.,
- B. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the Contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 1 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.
- C. Requests for substitutions will be considered in accordance with provisions of Division 01 - Product Requirements.

2.2 SOLID COLOR REINFORCED COMPOSITE (SCRC) SUBSTRATE

- A. Solid Color Reinforced Composite (SCRC) Toilet Partitions: Bobrick SierraSeries.
 - 1. Design Type:
 - a. Standard Height.
 - 1) Door/Panel Height: 58 inches (147 cm).
 - 2) Floor Clearance: 12 inches (30 cm).
 - 2. Privacy Style Partitions: No sightlines with gap-free interlocking doors and stiles routed 0.300 inches (7.6 mm) from the edge to allow for 0.175 inch (4.4 mm) overlap to prevent line-of-sight into the toilet compartment. Privacy strips fastened or adhered onto the partition material are not acceptable.
 - 3. Mounting:
 - a. Floor-mounted.
 - 1) Stile Standard Height: 69 inches (175 cm); stile Maximum Height: 75-5/16 inches (194 cm).
 - b. Floor-mounted, overhead-braced with satin finish, extruded anodized aluminum headrails, 0.065 inch (1.65 mm) thick with anti-grip profile.
 - 1) Stile Maximum Height: 83 inches (211 cm).
 - c. Floor-to-ceiling.
 - 1) Stile Height: As required, 10 feet 0 inches (305 cm) maximum.
- B. Solid Color Reinforced Composite (SCRC) Urinal Screens: Bobrick SierraSeries.
 - 1. Mounting Configuration:
 - a. Wall-hung.
 - 1) Screen Height: 42 inches (107 cm) with 18 inches (46 cm) floor clearance.
- C. Materials: Solid color reinforced composite (SCRC) material for stiles, panels, doors, and screens with Bobrick GraffitiOff coating, thermoset and integrally fused into homogenous piece; high density polyethylene (HDPE), high density polypropylene not acceptable.
 - 1. Composition: Dyes, organic fibrous material, and polycarbonate/phenolic resins.
 - 2. Surface Treatment: Non-ghosting, graffiti resistant surface integrally bonded to core through a manufacturing steps requiring thermal and mechanical pressure.
 - 3. Edges: Same color as the surface.
 - 4. Color:
 - a. SC02 Desert Beige.
- D. Performance Requirements:
 - 1. Graffiti Resistance (ASTM D 6578): Passed cleanability test; 5 staining agents.
 - 2. Scratch Resistance (ASTM D 2197): Maximum load value exceeds 10 kilograms.
 - 3. Impact Resistance (ASTM D 2794): Maximum impact force exceeds 30 inch-pounds.
 - 4. Smoke Developed Index (ASTM E 84): Less than 450.
 - 5. Flame Spread Index (ASTM E 84): Less than 75.
 - 6. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B.
 - 7. Uniform Building Code: Class II.
- E. Finished Thickness:

1. Stiles and Doors: 3/4 inch (19 mm).
 2. Panels and Screens: 1/2 inch (13 mm).
- F. Stiles: Floor-anchored stiles furnished with expansion shields and threaded rods.
1. Leveling Devices: 7 gauge, 3/16 inches (5 mm) thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 3/8 inch (10 mm) diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.
 2. Stile Shoes: One-piece, 22 gauge (0.8 mm), 18-8, Type 304 stainless steel, 4 inch (102 mm) height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch (19 mm) or 1 inch (25 mm) stile thickness and capable of being fastened (by clip) to stiles starting at wall line.
- G. Wall Posts: Pre-drilled for door hardware, 18-8, Type 304, 16 gauge (1.6 mm) stainless steel with satin finish; 1 inch (25 mm) x 1-1/2 inches (38 mm) x 58 inches high (1473 mm).
- H. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 05 50 00 - Metal Fabrications.
- I. Hardware: Chrome-plated "Zamak", aluminum, extruded plastic hardware not acceptable.
1. Compliance: Operating force of less than 5 lb (2.25 kg).
 2. Emergency Access: Hinges, door latch allow door to be lifted over keeper from outside compartment on inswing doors.
 3. Materials: 18-8, Type 304, heavy-gauge stainless steel with satin finish.
 4. Doorstops: Prevents inswinging doors from swinging out beyond stile; on outswing doors, doorstop prevents door from swinging in beyond stile.
 5. Fastening: Hardware secured to door and stile by through-bolted, theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners secured directly into core not acceptable.
 - a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb (680 kg) per insert.
 6. Clothes Hooks: Projecting no more than 1-1/8 inch (29 mm) from face of door.
 7. Door Latch: Track of door latch prevents inswing doors from swinging out beyond stile; on outswing doors, door keeper prevents door from swinging in beyond stile; 16 gauge (1.6 mm) sliding door latch, 14 gauge (2 mm) keeper.
 8. Locking: Door locked from inside by sliding door latch into keeper.
 9. Hinge Type:
 - a. Standard.
 - 1) Balanced, with field-adjustable cam to permit door to be fully closed or partially open when compartment is unoccupied.
 10. Mounting Brackets:
 - a. Standard Concealed.
 - 1) Mounting Brackets: Mounted inside compartment; exposed brackets on exterior of compartment not acceptable with the exception of outswing doors.
 - b. Full-Height.
 - 1) Mounting Brackets: 18 gauge (1.2 mm) stainless steel and extend

- full height of panel.
- 2) U-Channels: Secure panels to stiles.

PART 3 PRODUCTS

3.1 PREPARATION

- A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.
 - 1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
 - 2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.
- B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.2 INSTALLATION

- A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
 - 1. Verify blocking and supports in walls and ceilings has been installed properly at points of attachment.
 - 2. Verify location does not interfere with door swings or use of fixtures.
 - 3. Use fasteners and anchors suitable for substrate and project conditions
 - 4. Install units rigid, straight, plumb, and level.
 - 5. Conceal evidence of drilling, cutting, and fitting to room finish.
 - 6. Test for proper operation.

3.3 ADJUSTING, CLEANING AND PROTECTION

- A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.
- B. Touch-up, repair or replace damaged products.
- C. Clean exposed surfaces of compartments, hardware, and fittings.

END OF SECTION

SECTION 10 22 38
OPERABLE PANEL PARTITIONS

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. Manually operated, acoustical panel partitions.
- B. Related Requirements:
 - 1. Division 05 Sections "Structural Steel Framing" and "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.

1.3 DEFINITIONS

- A. NIC: Noise Isolation Class.
- B. NRC: Noise Reduction Coefficient.
- C. STC: Sound Transmission Class.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For operable panel partitions.
 - 1. Include plans, elevations, sections, details, numbered panel installation sequence, and attachments to other work.
 - 2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

- C. Samples for Initial Selection: For each type of exposed material, finish, covering, facing, or accessory involving color selection.
- D. Delegated-Design Submittal: For operable panel partitions.
 - 1. Include design calculations for seismic restraints.
- E. Qualification Data: For qualified Installer.
- F. Seismic Qualification Certificates: For operable panel partitions, tracks, accessories, and components, from manufacturer. Include seismic capacity of partition assemblies to remain in vertical position during a seismic event and the following:
 - 1. Basis for Certification: Indicate whether certification is based on analysis, testing, or experience data, according to ASCE/SEI 7.
 - 2. Detailed description of partition anchorage devices on which the certification is based and their installation requirements.
- G. Product Certificates: For each type of operable panel partition.
- H. Product Test Reports: For each operable panel partition, for tests performed by a qualified testing agency.
- I. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For operable panel partitions to include in maintenance manuals.
 - 1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - a. Panel finish facings and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
 - b. Seals, hardware, track, track switches, carriers, and other operating components.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

- B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.9 COORDINATION

- A. Coordinate floor flatness and levelness requirements for operable panel partitions with Work for concrete slabs-on-grade specified in Division 03 Section "Cast-in-Place Concrete."

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of operable panel partitions.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified civil or structural engineer licensed in the State of California to design seismic bracing of tracks to structure above.
- B. Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the California Building Code.
 - 1. The term "withstand" means "the partition panels will remain in place without separation of any parts from the system when subjected to the seismic forces specified."
- C. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
- D. Fire-Test-Response Characteristics: Provide panels with finishes complying with one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a 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. Fire Growth Contribution: Complying with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

2.2 MANUFACTURERS

- A. Basis-of-Design Manufacturer: In other Part 2 Articles where named manufacturer's products are indicated, Drawings and Specifications are based on products manufactured by the following:
 1. Modernfold, Inc.; a DORMA Group company.
 - a. Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:
 - 1) Approved Equal.

2.3 OPERABLE PANEL PARTITIONS

- A. Basis-of-Design Product: Drawings and Specifications are based on the following:
 1. Paired Panels: Modernfold, Inc.; a DORMA Group company; Acousti-Seal 932 operable panel system.
- B. General Description: Manually operated, center stacked, paired panel, operable panel partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
 1. STC: Not less than 50.
- C. Panels: Panel construction as required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
 1. Panel Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
 - a. Panel Width: Manufacturer's standard widths, 48 inches nominal.
 - b. Panel Thickness: Manufacturer's standard thickness, 3 inches nominal.
 2. Panel Weight: 8 lb/sq. ft. maximum.

3. Panel Materials:
 - a. Frame: Steel sheet, manufacturer's standard, 0.0508-inch (18 gauge) nominal minimum thickness for uncoated steel.
 - b. Face/Liner Sheets: Tension-leveled steel sheet, manufacturer's standard 0.0299-inch minimum nominal thickness for uncoated steel.
 4. Panel Closure: Manufacturer's standard unless otherwise indicated.
 5. Panel Edges (Trimless): Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.
- D. Panel Finish Facings: Provide finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
1. Vinyl-Coated Fabric Wall Covering: Manufacturer's standard, mildew-resistant, washable, vinyl-coated fabric wall covering; complying with CFFA-W-101-D for type II; Class A.
 - a. Total Weight: 15 ounces per lineal yard (10 ounces per square yard).
 - b. Antimicrobial Treatment: Additives capable of inhibiting growth of bacteria, fungi, and yeasts.
 - c. Color/Pattern: **Koroseal Interior Products to be selected.**
 - d. Apply one-piece, seamless facings free of air bubbles, wrinkles, blisters, and other defects. Horizontal seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
- E. Seals, General: Provide seals that produce operable panel partitions complying with performance requirements and the following:
1. Manufacturer's standard seals unless otherwise indicated.
 2. Seals made from materials and in profiles that minimize sound leakage.
 3. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.
 4. Vertical Seals: Deep-nesting, interlocking steel astragals mounted on each edge of panel, with continuous PVC acoustical seal.
 5. Horizontal Top Seals: Continuous-contact, extruded-PVC seal exerting uniform constant pressure on track.
 6. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
 - a. Automatically Operated for Acoustical Panels: Extension and retraction of bottom seal automatically operated by movement of partition
 - b. Operating clearance of 2 inches and operating range of plus 1/2 inch and minus 1-1/2 inches between seal and floor finish.

F. Suspension System:

1. Tracks: Steel track with adjustable steel hanger rods for overhead support, designed for operation, size, and weight of operable panel partition indicated. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
 - a. Basis of Design: Modernfold; No. 17 track system.
2. Panel Guide: Aluminum guide on both sides of the track to facilitate straightening of the panels; finished with factory-applied, decorative, protective finish.
3. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.
4. Carriers: Trolley system as required for track indicated, all steel with ball-bearing wheels, one carrier per panel.
5. Track Intersections, Switches, and Accessories: As required for operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.
6. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.
7. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

- G. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable panel partitions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.
- B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.

- C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.
- F. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals.

3.3 ADJUSTING

- A. Adjust operable panel partitions, hardware, and other moving parts to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust pass doors to operate smoothly and easily, without binding or warping.
- C. Verify that safety devices are properly functioning.

3.4 CLEANING AND PROTECTION

- A. Cleaning: Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Protection: Provide protection and maintain conditions in a manner acceptable to the manufacturer and installer that insure operable partitions are without damage or deterioration at time of Substantial Completion.

3.5 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operable-partition operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain operable panel partitions.

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. This Section includes the following:
 - 1. Washroom accessories.
 - 2. Custodial accessories.
 - 3. Underlavatory guards.
- B. Owner-Furnished Contractor Installed Accessories: Owner-furnished Contractor installed accessories are indicated Part 3 Article "Owner Furnished, Contractor Installed Accessories."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- 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. 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. Regulatory Requirements: Toilet room accessories and mounting heights shall comply with accessibility requirements of the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and with the California Building Code, Chapter 11B, "Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Publicly Funded Housing."
 - 1. The height from the floor to any operating mechanism or point of dispensing shall not exceed 40-inches.
- C. 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 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 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) or 15 (fifteen) years from date of Substantial Completion as indicated in the Accessory schedule at the end of the Section.

PART 2 - PRODUCTS

2.1 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.

2.2 WASHROOM, SHOWER AND CUSTODIAL ACCESSORIES

- A. Scheduled Accessories: Accessories are scheduled in Part 3 articles "Contractor Furnished and Installed Accessories" and "Owner Furnished, Contractor Installed Accessories.
- B. Scheduled Accessories: Accessories are scheduled in Part 3 article "Contractor Furnished and Installed Accessories."
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each accessory type indicated 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) Bradley Corporation.

2.3 UNDERLAVATORY GUARDS

- A. Underlavatory Guard:
 - 1. Basis-of-Design Product: Drawings and Specifications are based on the following:
 - a. Truebro, Inc., Lavguard2 series underlavatory 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 underlavatory guard assemblies. Underlavatory 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 underlavatory 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.

2.4 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.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 1. Accessories mounted on walls within toilet compartments or within 2 feet of water closets, lavatories, sinks, urinals, or similar plumbing fixtures shall be installed with penetration of wall finishes sealed to protect structural elements within walls 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.

3.2 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.

3.3 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 dispenser: Provide minimum one surface mounted paper towel dispenser for each sink or lavatory; at multiple lavatory locations, provide minimum one towel dispenser for every 2 lavatories. See floor plans for amounts.
2. Soap Dispenser: Provide one surface mounted soap dispenser for each sink or lavatory.
3. Toilet Tissue Dispenser: Provide one surface mounted toilet tissue dispenser for each toilet; provide semi-recessed toilet tissue dispensers at wheel chair accessible toilets.
4. Seat Cover Dispenser: Provide one surface mounted seat cover dispenser for each toilet.
5. Grab Bars: Provide one 36-inch grab bar at the back of the toilet and one 48-inch grab bar at the side of the toilet for all wheel chair accessible toilets.

3.4 CONTRACTOR FURNISHED AND INSTALLED ACCESSORIES

- A. General: Exposed surfaces of accessories shall be stainless steel with a satin finish unless otherwise indicated.
- B. The following accessories shall be furnished and installed by the Contractor:

Reference	Description
Grab Bars for accessible toilets	Bobrick B-6806 x 36, B-6806 x 48 1-1/2 inch diameter, satin finish, concealed mounting with snap flange. Provide one 48 inch and one 36 inch grab bar at each wheel chair accessible toilet stall.
Mop Holder, 4 holders	Bobrick B-239 x 36 Shelf, Mop and Broom holder, surface mounted, type 304 stainless steel, 4 anti-slip mop holders with rubber cams.
Sanitary Napkin Disposal Container	Bobrick B-270 (Contura Series) Sanitary napkin Disposal container, surface mounted (projects 3-13/16 inches from wall).
Seat Cover Dispenser	Bobrick B-4221 (Contura Series) Seat cover dispenser, surface mounted, capacity of 250 single or half fold toilet seat covers, fills from bottom.
Baby Changing Table	Bobrick Koala Kare KB200-SS Surface mounted baby changing table.
Soap Dispenser, counter top mount (Restrooms)	Bobrick B-822 Liquid soap dispenser, counter top mounted, top filling, 34 oz. capacity, 4-inch spout length, bright stainless steel finish, ABS plastic body and shank.

Reference	Description
Soap Dispenser, wall mount (Classrooms and Kitchen)	Bobrick B-4112 (Contura Series) Liquid soap dispenser, surface wall mounted, 40 oz. capacity, concealed mounting, projects 3-5/16 inch wall to push button.
Toilet Paper Dispenser, surface mount	B-4288 (Contura Series) Surface Mounted Multi-Roll Dispenser
Surface mounted Paper Towel Dispenser	B-2974 Automatic, Universal Surface-mounted roll towel dispenser.
Recessed Paper Towel Dispenser and Waste Receptacle combo	Bobrick B-3961 (Classic Series) Universal, roll paper towel dispenser with 18 gallon receptacle

3.5 OWNER FURNISHED AND CONTRACTOR INSTALLED ACCESSORIES

- A. The following accessories shall be furnished by Owner and installed by the Contractor:

Reference	Description

END OF SECTION

SECTION 104400
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. Fire extinguisher cabinets.
 - 2. Portable fire extinguishers, with mounting bracket for fire extinguisher.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated. Include 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.
 - 2. Fire Extinguishers: Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
- C. Product Schedule: For fire extinguishers. Use same designations indicated on Drawings.
- D. Maintenance Data: For fire extinguishers and fire protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and fire-extinguisher cabinets through one source from a single manufacturer.
- B. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

- C. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- D. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1.5 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.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).
- C. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. Fire Extinguishers:
 - a. Ansul, Inc.

- b. JL Industries, Inc.
- 2. Fire Extinguisher Cabinets and Accessories:
 - a. Ansul, Inc.
 - b. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - c. Larsen's Manufacturing Company.
 - d. Potter Roemer LLC.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. 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 indicated in Drawings.
- B. 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 wet-chemical type fire extinguisher in the Kitchen. Refer to locations indicated in Drawings.
 - 2. A placard shall be conspicuously placed near the extinguisher that states that the fire protection system shall be activated **prior** to using the portable fire extinguisher. 2019 CFC, Section 906.2
- C. Valves: Manufacturer's standard.
- D. Handles and Levers: Manufacturer's standard.
- E. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

2.4 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
 - 1. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.
- 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.

2.5 FIRE EXTINGUISHER CABINETS

- A. Cabinet Type: Semi-recessed Cabinet, size suitable for fire extinguisher, box partially recessed in walls of sufficient depth to suit style of trim 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: Nonrated.
 - 2. Cabinet Material: Steel sheet.
 - 3. Cabinet Trim Material: Steel sheet.
 - 4. Trim: Rolled edge trim with 1-1/2-inch or 2-1/2-inch backbend depth as standard with manufacturer.
 - 5. Wall Recess: Cabinet shall require of wall recess of no more than 4 inches.
 - 6. Projection from Wall: Cabinet including trim and pull handles shall not project more than 4 inches from the finished wall surface.
- B. Door Style: Vertical duo panel with frame, duo panel adjacent to strike edge of door.
 - 1. Door Material: Stainless Steel sheet.
 - 2. 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: Provide 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: Provide continuous hinge, of same material and finish as trim permitting door to open 180 degrees.
- D. Identification: Identify fire extinguisher 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. Finishes: Manufacturer's standard baked-enamel paint or powder coat finish for exposed and semi-exposed surfaces.
 - 1. Color: Factory Finish.

2.6 FABRICATION

- 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Fire Extinguishers: Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Fire Extinguisher Cabinets: Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.
- 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 extinguisher cabinets, extinguishers, and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 1. Mounting Heights: Mount cabinets and brackets so that the top of installed fire extinguishers will be 48 inches above the finished floor.
- B. Fire Extinguisher Cabinets: Fasten cabinets to structure, square and plumb.
 1. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

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 114000
FOOD SERVICE 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. Fabricated equipment.

1.3 COORDINATION

- A. Coordinate foodservice equipment layout and installation with other work, including layout and installation of lighting fixtures, HVAC equipment, and fire-suppression system components.
- B. Coordinate locations and requirements of utility service connections.
- C. Coordinate sizes, locations, and requirements of the following:
 - 1. Overhead equipment supports.
 - 2. Equipment bases.
 - 3. Floor depressions.
 - 4. Floor areas with positive slopes to drains.
 - 5. Floor sinks and drains serving foodservice equipment.
 - 6. Roof curbs, equipment supports, and penetrations.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product. Include the following:
 - 1. Manufacturer's model number.
 - 2. Accessories and components that will be included for Project.

3. Clearance requirements for access and maintenance.
 4. Utility service connections for water, drainage, power, and fuel; include roughing-in dimensions.
- C. Shop Drawings: For fabricated equipment. Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.
 - D. Samples for Initial Selection: For units with factory-applied color finishes.
 - E. Samples for Verification: For each factory-applied color finish required, in manufacturer's standard sizes.
 - F. Sample Warranty: For special warranty.
 - G. Operation and Maintenance Data: For foodservice equipment to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Product Schedule: For each foodservice equipment item, include the following:
 - 1) Designation indicated on Drawings.
 - 2) Manufacturer's name and model number.
 - 3) List of factory-authorized service agencies including addresses and telephone numbers.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with foodservice equipment by field measurements before fabrication. Indicate measurements on Coordination Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NSF Standards: Provide equipment that bears NSF Certification Mark or UL Classification Mark certifying compliance with applicable NSF standards.

2.2 EQUIPMENT

- A. Equipment Schedule: Refer to schedule on Sheet A201 Drawings for complete kitchen equipment coordination.

- B. Installation Accessories: Provide all rough-in hardware, supports and connections, attachment devices, closure trim, and accessories required for complete installation.

2.3 FABRICATED EQUIPMENT

A. Stainless Steel Tables:

1. Description: Flat-countertop and Preparation tables.
 - a. Tops: Stainless steel, Type 304, 0.078 inch (1.98 mm) thick, reinforced and sound deadened.
 - 1) Back Splash (Standard): 4 inches (101.6 mm).
 - 2) Back Splash (at 3-Compartment Sinks): 8 inches (203.2 mm).
 - 3) Edge: Marine edge.
 - b. Sink: Stainless steel, Type 304, 0.078 inch (1.98 mm) thick, welded into tabletop.
 - c. Legs and Feet: Stainless steel tubing legs with adjustable bullet feet.
2. Materials:
 - a. Stainless Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, type as indicated.
 - b. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with minimum G90 (Z275) coating.
3. Fabrication: Prepare table for installation of the following equipment items:
 - a. Food waste disposer; weld disposer cone or collar into sink.
4. Stainless Steel Finish: Directional satin finish, ASTM A 480/A 480M, No. 4.

B. Stainless Steel Shelf Units:

1. Description: Wall mounted. Fabricate units of stainless steel, Type 304, 0.050 inch (1.27 mm) thick.
2. Stainless Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, type as indicated.
3. Stainless Steel Finish: Directional satin finish, ASTM A 480/A 480M, No. 4.

2.4 MISCELLANEOUS MATERIALS

- A. Installation Accessories, General: NSF certified for end-use application indicated.
- B. Elastomeric Joint Sealant: ASTM C 920; silicone. Type S (single component), Grade NS (nonsag), Class 25, Use NT (nontraffic) related to exposure, and Use M, G, A, or O as applicable to joint substrates indicated.

1. Public Health and Safety Requirements:
 - a. Sealant is certified for compliance with NSF standards for end-use application indicated.
 - b. Washed and cured sealant complies with the FDA's regulations for use in areas that come in contact with food.
2. Cylindrical Sealant Backing: ASTM C 1330, Type C, closed-cell polyethylene, in diameter greater than joint width.

2.5 FINISHES

A. 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.

- B. Powder-Coat Finishes: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install foodservice equipment level and plumb, according to manufacturer's written instructions.
1. Connect equipment to utilities.
 2. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.
- B. Complete equipment assembly where field assembly is required.
1. Provide closed butt and contact joints that do not require a filler.
 2. Grind field welds on stainless steel equipment until smooth and polish to match adjacent finish.
- C. Install equipment with access and maintenance clearances that comply with manufacturer's written installation instructions and with requirements of authorities having jurisdiction.

- D. Install joint sealant in joints between equipment and abutting surfaces with continuous joint backing unless otherwise indicated. Produce airtight, watertight, vermin-proof, sanitary joints.

3.2 CLEANING AND PROTECTING

- A. After completing installation of equipment, repair damaged finishes.
- B. Clean and adjust equipment as required to produce ready-for-use condition.
- C. Protect equipment from damage during remainder of the construction period.

END OF SECTION

SECTION 11 52 70
TELEVISION MOUNTS

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. Television mounts and accessories.
- B. Related Sections:
 - 1. Division 26 Sections for electrical service and connections.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Show layouts and types of wall mounting equipment.
- D. Operation and Maintenance Data: For television mounts to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain television mounts from a single source and from a single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. Fixed Wall Mount

- a. Planar Systems; FWM-MXL Universal Low Profile Flat Mount
 - b. Premier Mounts; P4263F Low-Profile Flat Mount
 - c. Chief, Legrand AV Inc.; RMF2 Medium Fit Fixed Wall Display Mount
- 2. Tilting Wall Mount
 - a. Planar Systems; WMT-MXL Universal Low Profile Tilt Mount
 - b. Premier Mounts; P4263T Low-Profile Tilting Mount
 - c. Chief, Legrand AV Inc.; RMT2 Medium Fit Tilt Wall Mount

2.2 TELEVISION MOUNTS AND ACCESSORIES

- A. General: Universal television mounting assembly and accessories for wall mounted television screens, landscape oriented. Includes back plate, adapter arms, and mounting hardware.
 - 1. One mount per television display.
 - 2. Orientation: Landscape.
 - 3. Weight Capacity: 100 lbs. min.
 - 4. Type: Fixed and Tilting type.
 - a. Verify with owner quantity and locations for each type.
 - 5. Tilt Angle: For tilting mount type, tilt angle to range to a minimum of 8° angle.
 - 6. Color: Black.
 - 7. Mounting Accessories: Include wood, masonry, steel stud attachment hardware per applicable wall condition.

PART 3 - EXECUTION

3.1 TELEVISION MOUNT INSTALLATION

- A. Install project mount and accessories in accordance with manufacturer's written installation instructions and as indicated on the Drawings.

END OF SECTION

SECTION 11 61 43 STAGE CURTAINS

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. Stage curtains, scrims, and drops.
 - 2. Draw-curtain tracks.
 - 3. Curtain rigging.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product and the following:
 - 1. Tracks: Capability of each track to support the weight and operation of curtains that it supports.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
 - 1. Include plans, elevations, sections, and attachment details of curtains.
 - 2. Include fabric assembly and hanging details.
 - 3. Dimension operating clearances.
 - 4. Include documentation of capacity of each batten, track, attachment, and rigging component to support loads.
- C. Samples for Initial Selection: For each type of stage curtain indicated. Include color charts showing full range of colors, textures, and patterns available, together with 12-inch- (300-mm-) square Sample (any color) of each fabric type and seam.
- D. Samples for Verification: Full width by minimum 12-inch- (300-mm-) long section of each fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which tracks, battens, and other stage-curtain equipment will be attached.
 - 2. Locations of lighting fixtures and cabling, ductwork, piping, and sprinklers.
 - 3. Rigging equipment for stage equipment.
 - 4. Access panels.
- B. Qualification Data: For Installer.
- C. Product Certificates: For the following, from manufacturer:
 - 1. Fabric: Provide name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.
 - 2. Rigging: Compliance of suspended battens and tracks with requirements.
- D. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For stage curtains and rigging to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of stage curtains.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install stage curtains until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Verify locations of supporting structural elements and construction contiguous with stage curtains and rigging by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of stage-curtain systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, faulty operation of rigging.
2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STAGE-CURTAIN SYSTEMS

- A. Description: Complete stage-curtain systems, including stage curtains, tracks, draw-curtain machines, and rigging; with necessary accessories for support and operation.
 1. Georgia Stage, Inc.
 2. iWeiss Theatrical Solutions
 3. NorthEast Stage
 4. Rose Brand
 5. S&K Theatrical Draperies, Inc.
 6. Tru-Roll, Inc.
- B. Source Limitations: Obtain stage-curtain systems from single manufacturer. Obtain each color, grade, finish, type, and variety of fabric from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Stage-curtain systems and attachments to structure shall withstand the effects of gravity and operational loads and the following loads and stresses:
 1. Design Loads: Weight of curtains.
- B. Fire-Test-Response Characteristics: Provide stage curtains meeting the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Flame-Propagation Resistance: Passes NFPA 701.
 - a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals and whether it requires retreatment after cleaning or after a designated time period of use.
 - b. Permanently attach 12-inch- (300 mm-) square swatch of same fabric and dye lot for each fabric of a curtain assembly to the back of assembly for use as fire-resistance test strip.

2.3 CURTAIN FABRICS

- A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment according to performance requirements indicated. Provide fabrics of each type and color from same dye lot.

- B. Polyester Velour: Napped fabric of 100 percent polyester weighing not less than 22 oz./linear yd. (683 g/linear m), with pile height approximately 75 mils (1.9 mm); inherently and permanently flame resistant; 64-inch (1372-mm) minimum width.
1. Basis-of-Design: 64 inch Encore Velour 22 oz. IFR.
 2. FR class: IFR – Inherently Flame Retardant.
 3. Color/Texture/Pattern: As selected by Architect from manufacturer's full range.
 4. Valance:
 - a. Description: Unlined, web at top with No. 3 grommets on 12" on center, 50% fullness, standard hems, 2 inches at sides and 5 inches at bottom.
 - b. Size: 4 foot height x 20 foot width; field verify.
 5. Main Traveler Drape Panels:
 - a. Description: Unlined, web and hooks at top on 12 inch on center, 50% fullness, standard hems on sides, and chain at bottom.
 - b. Size: 15 foot height x 10 foot width; field verify.

2.4 CURTAIN-BOTTOM WEIGHTS

- A. Individual Weights: Curtain manufacturer's standard segmented weights to suit each curtain type and location.
- B. Proof Coil Chain: Grade 30, No. 8, zinc plated, 3/16 inch (4.7 mm), ASTM A413/A413M.
- C. Weight Tape: Curtain manufacturer's standard, continuous weight tape to suit each curtain type and location.
- D. Pipe or Conduit Weight and Stiffener: Curtain manufacturer's standard or recommended stiffening pipe or conduit that slides into bottom hem, suitable for curtain type and location indicated.

2.5 CURTAIN FABRICATION

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on fabric not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width. Orient velour fabric with the fabric nap down.
- B. Vertical and Top Hems: Machine sew hems as follows unless otherwise indicated:
1. Vertical Hems: Minimum 2 inches (50 mm) wide, with not less than a 1-inch (25-mm) tuck and with no selvage material visible from front of curtain. Sew open ends of hems closed.

2. Turnbacks: Provide leading- and trailing-edge turnbacks for traveler curtains, formed by folding back not less than 12 inches (300 mm) of face fabric, with not less than a 1-inch (25-mm) tuck, and vertically secured by sewing.
 3. Top Hems: Reinforced by double-stitching 3-1/2-inch- (89-mm-) wide, heavy, jute or laminated synthetic webbing to top edge on back side of curtain with not less than 2 inches (50 mm) of face fabric turned under.
- C. Fullness:
1. 50 Percent Fullness: Provide fullness, exclusive of turnbacks and hems, by sewing additional material into 3-inch (75-mm) double-stitched, flat, box pleats spaced at 12 inches (300 mm) o.c. along top hem reinforcement.
- D. Grommets: Brass, No. 3.
1. Black Curtains: Provide brass or aluminum grommets with black finish.
 2. Pleated Curtains: Center grommets on each box pleat and place 1 inch (25 mm) from corner of curtain; for snap hooks or S-hooks.
- E. Bottom Hems: Machine sew hems as follows unless otherwise indicated:
1. For Curtains With Fullness:
 - a. Floor-Length Curtains: Hems not less than 5 inches (150 mm) deep, with 2-inch (25-mm) weight tape sewn to top seam of the bottom hem, clear of the finished bottom edge, and with open ends of hems sewn closed.
 - b. Floor-Length Curtains: Hems not less than 5 inches (150 mm) deep, with individual weights in individual closed pockets sewn above finished bottom edge of curtain, and with open ends of hems sewn closed.

2.6 SCRIMS AND DROPS

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on fabric not visible to audience. Provide vertical seams unless otherwise indicated. Do not use fabric cuts less than one-half width.

2.7 CURTAIN ACCESSORIES

- A. Snap Hooks: Manufacturer's standard heavy-duty hooks[, sewn to top edge of curtain] [, blind sewn to top hem of curtain] [, attached to top hem with nylon strap secured by rivets] 12 inches on center.

2.8 STEEL CURTAIN TRACK

- A. Steel Track: Roll-formed, galvanized, commercial-quality, zinc-coated steel sheet, ASTM A653/A653M; G60 (Z180) coating designation; with continuous bottom slot and with each half of track in one continuous piece; black paint finish; complete with necessary accessories for support and operation of bi-parting curtain track assembly.
1. Georgia Stage, Inc.

2. iWeiss Theatrical Solutions
3. NorthEast Stage
4. Rose Brand
5. S&K Theatrical Draperies, Inc.
6. Tru-Roll, Inc.
7. Steel Thickness: As recommended by manufacturer for loads and operation.

a. Heavy Duty: Minimum 0.079 inch (2.01 mm).

- B. Clamp and Bracket Hangers: Steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.
- C. Track-Lap Clamp: Metal to match track channel for attaching two tracks at center overlap.
- D. Folding Guide: Where indicated, equip carriers with rear-fold or backpack guide and rubber spacers to fold curtain from the offstage end of the track; sized for use with operating line if any.
- E. Heavy-Duty Track System: Equip track with heavy-duty components as recommended by manufacturer for loads and operation. Provide end stops for track.
 1. Curtain Carriers: Standard carriers of plated steel with a pair of neoprene-tired ball-bearing wheels riveted parallel to body. Equip carriers with rubber or neoprene bumpers to reduce noise, and heavy-duty, plated-steel swivel eye and trim chain for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.
 - a. Master Curtain Carriers: One master carrier, for each leading curtain edge, of plated steel with two pairs of neoprene-tired ball-bearing wheels and with two line guides per carrier.
 2. Pulleys: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable pulley to maintain proper tension on operating line; each with not less than 5-inch (125-mm) molded-nylon- or glass-filled-nylon-tired ball-bearing sheaves enclosed in steel housings. Provide pulleys with steel housing finished to match track and with bracket for securing off-stage curtain end.
- F. Manual Cord Operation: Provide with cord operating line, 3/8-inch- (9-mm-) diameter, stretch-resistant operating cord of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.

2.9 CURTAIN RIGGING

- A. Battens: Fabricated from steel pipe with a minimum number of joints. Connect pipe at joints with a drive-fit pipe sleeve not less than 18 inches (450 mm) long, and secure with four flush rivets, plug welds, threaded couplings, or another equally strong method.

1. Steel Pipe: ASTM A53/A53M, Grade A, standard weight (Schedule 40), black, NPS 1-1/2 (DN 40) nominal diameter unless otherwise indicated.
 2. Finish: Shop painted black, with a 1-inch- (25-mm-) wide yellow stripe at center of each batten.
- B. Supports, Clamps, and Anchors: ASTM A153/A153M, Class B, galvanized sheet steel in manufacturer's standard thicknesses, galvanized after fabrication.
- C. Trim and Support Cable: 1/4-inch- (6-mm-) diameter, 7x19 galvanized-steel cable with a breaking strength of 7000 lb. (3175 kg). Provide fittings according to cable manufacturer's written instructions for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.
- D. Trim and Support Chain: ASTM A391/A391M, Grade 80, hardened alloy steel chain rated for overhead lifting.
- E. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work.
- B. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install stage-curtain system according to curtain and track manufacturer's written instructions.

3.3 BATTEN INSTALLATION

- A. Install battens by suspending at heights indicated with trim and supports spaced to support load, except do not exceed 10 feet (3 m) between supports.
1. Cable Trim and Support: Secure cables either directly to structures or to inserts, eye screws, or other devices that are secure and appropriate to substrate and that are not subject to deterioration or failure with age or elevated temperatures. Attach other cable end to pipe clamps with turnbuckles, housed or fixed with nuts after adjustment, to prevent loosening.
 2. Chain Trim and Support: Secure chain with load-rated terminations.

3.4 TRACK INSTALLATION

- A. Batten-Hung Track: Install track by suspending from pipe batten with manufacturer's track clamp hangers attached to batten pipe clamps at track-support spacing, according to manufacturer's written instructions.
- B. Track-Support Spacing: According to manufacturer's recommendations for applied loads, but not exceeding the following dimensions between supports:
 - 1. Heavy-Duty Track: 72 inches (1829 mm).
- C. Install track for center-parting curtains with not less than 24-inch (600-mm) overlap of track sections at center, supported by track lap clamps.

3.5 CURTAIN INSTALLATION

- A. Track Hung: Secure curtains to track carriers with snap hooks.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain stage curtains and tracks.

END OF SECTION

SECTION 12 24 13 ROLLER SHADE

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. Manually operated sunscreen roller shade.
 - 2. Electrically operated sunscreen roller shade.
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.
 - 2. Division 06 Section "Rough Carpentry" for wood blocking for mounting vertical louver blinds and accessories.
 - 3. Division 09 Section "Gypsum Board Assemblies" for coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.
 - 4. Division 16 Section "Electrical" for electric service for motor controls.

1.3 REFERENCES

- A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. NFPA 70 - National Electrical Code.
- C. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for sunscreen roller shade.
- C. Samples for Initial Selection: For each type of sunscreen roller shade.
 - 1. Include similar Samples of accessories involving color selection.

- D. Window Treatment Schedule: For sunscreen roller shade. Use same designations indicated on Drawings.
- E. Maintenance Data: For roller shade to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- C. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.
- D. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install sunscreen roller shade until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where sunscreen roller shade are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 WARRANTY

- A. Roller Shade Hardware, Chain and Shadecloth: Manufacturer's standard non-depreciating twenty-five year limited warranty.
- B. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five-year warranty.

- C. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 - PRODUCTS

2.1 SUNSCREEN ROLLER SHADE

- A. Manufacturer: Subject to compliance with requirements, provide products manufactured by one of the following:
 - 1. MechoShade Systems, Inc. or Architect approved equal.
- B. Shade Cloth:
 - 1. Visually Transparent Single-Fabric Shadecloth:
 - a. MechoShade Systems, Inc., ThermoVeil group, single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl
 - b. Colors selected from manufacturer's available range.
- C. Shade Band:
 - 1. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
 - 2. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
 - 3. Shade band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.
 - b. Provide for positive mechanical engagement with drive / brake mechanism.
 - c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
 - d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable

D. Shade Fabric:

1. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
2. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem with concealed hemtube.
3. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
4. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.

2.2 COMPONENTS

A. Access and Material Requirements:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable

B. Motorized Shade Hardware and Shade Brackets.

1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).

3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the motor axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade motor (multi-banded shade, subject to manufacturer's design criteria).
4. Provide fascia at all shades and end caps in conditions where bracket ends are exposed.

C. Manual Operated Chain Drive Hardware and Brackets:

1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
2. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
3. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
4. Drive Bracket / Brake Assembly:
 - a. MechoShade Drive Bracket model M5.
 - b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
 - c. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
 - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
 - e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
5. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.3 SHADE MOTOR DRIVE SYSTEMS.

A. Shade Motors:

1. Tubular, asynchronous (non-synchronous) motors, with built-in reversible capacitor operating at 110v AC (60hz), single phase, temperature Class A, thermally protected. MechoSystems IQ2 Whispershade intelligent, addressable

EDU, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each motor.

2. Conceal motors inside shade roller tube.
 3. Maximum current draw for each shade motor of 2.3 amps.
 4. Each EDU shall possess a minimum lift capacity of 6nm.
 5. Quiet performance of less than 44db at standard industry distances.
 6. Use motors rated at the same nominal speed for all shades in the same room.
- B. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade motor and tube assembly.

2.4 MOTOR CONTROL SYSTEMS

- A. Wall Switches: Five-button architectural flush mounted switches with metal cover plate and no exposed fasteners. Sufficient switching shall be supplied to allow independent operation of shade-groups by elevation within a room, as well as separate operation of shades at clerestory level.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances locations of connections to building electrical system and other conditions affecting performance.
1. Proceed with installation 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.

3.3 INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.

B. Responsibility for Motorized Interior Roller Shades:

1. Electrical Contractor shall provide power panels and circuits of sufficient size to accommodate roller shade manufacturer's requirements, as indicated on the mechanical and electrical drawings.
2. Electrical Contractor shall run line voltage (of sufficient quantity, in sufficient capacity as required) terminating in junction boxes in locations designated by roller shade dealer and terminate quick-disconnect pigtails (provided by Shade Dealer).
3. Electrical Contractor shall provide and run all low voltage control wire from the motors to the switch locations. All above-ceiling and concealed wiring shall be plenum-rated, or installed in conduit, as required by the electrical code having jurisdiction.
4. Shade Dealer shall supply low-voltage switches and terminate low-voltage wires at shade motors and at switches.
5. Shade Dealer shall supply product and site-specific wiring diagrams prior to electrical rough-in.
6. Shade Dealer shall program all shade switches to meet the control requirements set forth in 'MOTOR CONTROL SYSTEMS'.

3.4 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.5 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shade are without damage or deterioration at time of Substantial Completion.
- C. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems
- D. Replace damaged vertical louver blinds that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 210000
FIRE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS:

- A. The General Mechanical Provisions, Section 230000, shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE:

- A. General: 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 entire facility shall be fire sprinklered.
- B. Design/Calculations: The sprinkler system has been designed and sized by hydraulic calculations in accordance with 2016 NFPA No. 13 and fire authority requirements. Calculations have been included in submittals. Provide current fire flow information from flow test at nearest fire hydrant. Fire flow test shall be done within 6 months of installation of sprinkler system.
- C. Preparation of Drawings and Material Data Sheets: A complete fire sprinkler submittal (drawings, specifications, materials and hydraulic calculations) has been prepared. Hydraulic calculations shall conform to 2016 NFPA 13, paragraph 23.3.5 in all respects.
- D. Coordination Drawings: Contractor shall submit coordination drawings with Contractor title block to Engineer for review, in addition to materials submittals. Deviations between bid documents and coordination drawings shall be specifically noted on drawings (highlighted, clouded, etc.). Any contractor requested design changes to these documents, including layout, materials, or calculations, may be considered a substitution and shall comply with paragraph 1.4 below.

1.3 WORK SPECIFIED ELSEWHERE:

- A. Electrical wiring.
- B. Fire alarm system.
- C. Painting of exposed piping.

1.4 DESIGN CHANGES/SUBSTITUTIONS:

- A. General: Design changes or substitutions of fire sprinkler system shall be submitted to Engineer for review.

- B. Significant changes in design or substitution of materials may require a construction change document, requiring resubmission to Local Fire Authority, as determined by the Engineer and/or authority having jurisdiction. Contractor shall bear all expenses incurred due to preparation and processing of design substitutions, up to and including submission to, and obtaining approval from, authority having jurisdiction. Refer to Section 23 00 00, 1.11, B.
- C. Any substitution of "Flexible" type piping in lieu of "Rigid" pipe or any changes to size, manufacturer or lengths of "Flexible" type piping will require resubmittal of piping plans, product data sheets and hydraulic calculations to Engineer and authority having jurisdiction for review and approval.

PART 2 - PRODUCTS

2.1 STANDARDS:

- A. All materials shall be in accordance with 2016 NFPA No.13 "Standard for the Installation of Sprinkler Systems".

2.2 PIPING MATERIALS:

- A. General: The pressure rating of all piping, valves, flanges and other piping accessories shall be in accordance with code and fire authority requirements. Pressure ratings shall exceed the highest possible working pressure.
- B. Piping:
 - 1. Above Grade:
 - a. 2" and Smaller: Threaded black steel pipe, ASTM A53, schedule 40. 175 psi WOG (min.) black cast iron threaded fittings, ANSI B16.4, UL listed. Unions shall be Class 150 malleable iron threaded, ANSI B16.3.
 - b. 2-1/2" and Larger: Welded black steel pipe, ASTM A53, schedule 10. Standard weight carbon steel welding fittings, ANSI B16.9. Flanges shall be steel, ANSI B16.5. Roll grooved pipe couplings may be used for assembling welded sections, Victaulic, Grinnell, Gruvlok.
- C. Gate Valve:
 - 1. 2" and Smaller: All bronze, rising stem. UL listed.
 - 2. 2-1/2" and Larger: Iron body, bronze mounted, outside screw and yoke. UL listed. (UL listed butterfly valves may be substituted for 4" and larger gate valves above grade.)
- D. Check Valve:
 - 1. 2" and Smaller: All bronze swing check. UL listed.
 - 2. 2-1/2" and Larger: Iron body, bronze mounted swing check. UL listed.
- E. Drain Valve: All bronze angle globe valve. UL listed.
- F. Anchors and Hangers: Shall comply with 2016 NFPA No. 13.

2.3 SPRINKLER HEAD:

- A. Automatic sprinkler head, concealed type in areas with finished ceilings and recessed or suspended lighting, semi-recessed in areas with finished ceilings and surface lighting, upright or pendent heads elsewhere (as allowed by NFPA 13). Heads in finished areas shall be Victaulic FireLock V38 quick response concealed, Tyco RFI quick response concealed, or Globe Fire Sprinkler Corp., Quick Response GL Series Concealed Pendent, with chrome-finish metal cover plate. Heads elsewhere shall be quick response, Victaulic FireLock V27, Tyco, Model TY-FRB or Globe Fire Sprinkler Corp., Model GL Quick Response, with standard finish. UL listed. Temperature ratings shall be in accordance with NFPA No. 13. Provide extra heads (of each type installed) in accordance with code requirements. Exposed heads installed with deflector lower than 7'-6" above floor shall have wire guards.

2.4 ALARM VALVE ASSEMBLY:

- A. Standard wet type alarm valve assembly and electric bell complete with trim as required by the authority having jurisdiction. Provide flow switch for connection to alarm system. Provide tamper switch. UL listed. Coordinate with Division 28.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION:

- A. General: Piping shall be concealed in walls, above the ceilings or below grade unless otherwise noted. Exposed piping 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, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. Depth of cover in traffic areas shall be 36 inches (minimum).
 - 1. Installer Certification: Installation shall be performed by certified fire sprinkler fitter(s) as required by CCR, Title 19, Divisions 1, Chapter 5.5. See CAL FIRE – Office of the State Fire Marshall Information Bulletin 17-002 for more information. The Bulletin can be downloaded from the following:
http://osfm.fire.ca.gov/informationbulletin/pdf/2017/IB_AESCert_final_05_25_17.pdf
- B. Standards: All piping shall be installed in accordance with 2016 NFPA No. 13 "Standard for the Installation of Sprinkler Systems".
- C. Miscellaneous:
 - 1. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings or floors in finished areas.
 - 2. Pattern: Sprinklers shall be installed in a symmetrical pattern with lighting fixtures and with ceiling pattern. Heads located in lay-in ceilings shall be centered in panel.

3. 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 and 2" annular clearance for piping 4" and larger.
4. Access: Provide access doors as required for all valves, devices, etc.
5. 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 2016 CBC Section 714.
6. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards, except where specifically allowed by CEC.

3.2 IDENTIFICATION:

- A. All controls, piping, valves and equipment shall be labeled for function and service in accordance with NFPA No. 13.

3.3 TESTS AND ADJUSTMENTS:

- A. Unless otherwise directed, tests shall be witnessed by a representative of the Architect and an inspector of the authority having jurisdiction. Contractor shall notify fire authority at least 48 hours prior to testing. At various stages and upon completion, the system must be tested in the presence of the enforcing agency. 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 the entire work retested. Test all systems in accordance with fire authority requirements and NFPA No. 13 and No. 24.

3.4 CERTIFICATION:

- A. At completion of the project, a Contractor's Material and Test Certificate, indicating installation and testing in accordance with referenced standards, shall be completed. Copies shall be prepared by Contractor for the approving authorities, Owner and Contractor. Deliver certificates to Owner through Architect.

END OF SECTION

SECTION 22 00 00 - PLUMBING

PART 1: - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS:

- A. The General Mechanical Provisions, Section 23 00 00, shall form a part of this Section with the same force and effect as though repeated here.

1.2 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.
 - 4. Fuel gas system.
 - 5. Drain system (including condensate drain).
 - 6. All equipment as shown or noted on the drawings or as specified.
 - 7. Coordinate and cooperate with commission agent as required by Section 01 91 13.
 - 8. Demolition as indicated on drawings. Where demolition is called for, remove all equipment, piping, braces, housekeeping pads, supports and related items no longer required.
 - 9. Lead Free: All equipment, fixtures, valves and fixture stops providing water for human consumption installed after January 1, 2010, must meet the "Lead Free" requirements for the State of California.
- B. Work Specified Elsewhere:
 - 1. Line voltage power wiring, disconnect switches and installation of all starters are included in the Electrical Section unless otherwise noted.
 - 2. Concrete and reinforcing steel unless specifically called for on the drawings or specifications.
 - 3. Painting unless specifically called for in the drawings or specifications.
 - 4. Carpentry.
 - 5. Control of domestic hot water circulating pumps.

PART 2: - PRODUCTS

2.1 PIPING MATERIALS:

- A. Sanitary Sewer:
 - 1. Soil, Waste and Vent Piping (Non-Pressurized):
 - a. Inside Building and Within Five Feet of Building Walls to Civil P.O.C.: Standard weight coated cast iron pipe and fittings. Plain end, CISPI 301, ASTM A888, or hub end with rubber gaskets, ASTM A74, ASTM C564. ABI, Tyler, Charlotte. Couplings shall be heavy-duty shielded couplings, Type 304 stainless steel, with neoprene gasket, ASTM C-1540. Husky HD 2000, Clamp-All 80,

Mission HeavyWeight. MG Couplings are also acceptable. 2" and smaller exposed to view shall be galvanized steel, ASTM A53, with coated cast iron recessed drainage fittings, ANSI B16.12.

Below grade cast iron pipe and fittings shall have 8 mil (minimum) Polyethylene Encasement (Poly Wrap), Per ANSI/AWWA C105/A21.5.

- b. Outside Building to Civil P.O.C.: Polyvinyl chloride (PVC), SDR-35, ASTM D3034 with PVC fittings with rubber ring joints. Piping within 10 feet of water piping shall be solid wall Schedule 40 PVC, ASTM D1785, D2665, with solvent weld DWV fittings, ASTM D2665, D3311. Piping with less than 24" of cover outside building walls shall be cast iron.
 2. Cleanouts: Comparable models of Josam, Wade, Mifab or Zurn are acceptable. Grease plug prior to installation. Floor Cleanouts: Smith 4023 with nickel bronze top in finished areas; Smith 4223 in utility areas. Wall Cleanouts: Smith 4532 with stainless steel cover and screw. Pipe Cleanouts: Iron body with threaded brass plug. Site cleanouts more than 5' outside building may be PVC with PVC plug.
 3. Cleanout Box: Precast reinforced concrete. Cast iron lid marked for service. Christy F8 in foot traffic areas; G5 in roadways. Provide with PVC pipe extension down to top of pipe.
- B. Storm Drain (Including Rain Water Leader, RWL) - 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 and Gas:
 1. Hot and Cold Water Piping: Materials used in the water system, except valves and similar devices, shall be of like material, except where otherwise approved by Engineer and Authority Having Jurisdiction, prior to start of work. For existing water systems of galvanized steel or copper, materials shall match existing.
 - a. Inside Building, Within Five Feet of Building Walls, and All Above Grade:
 - (1) 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, lead-free solder. All nipples shall be red brass (85% copper). Above grade fittings may be copper press fittings, ASME B16.18 or ASME B16.22. EPDM O-rings. Installation shall be in accordance with the manufacturer's installation instructions. ProPress.
 - b. Outside Building - Below Grade to Civil P.O.C.:
 - (1) Same as Inside Building.
 - or- (2) 3" and Smaller: Schedule 80 Polyvinyl chloride (PVC), ASTM D1785, with Schedule 80 PVC solvent weld fittings, ASTM D2466 where approved by administrative authority.
 2. Gas Piping:
 - a. Inside Building and All Above Grade: 2" and Smaller: Schedule 40 galvanized steel pipe, ASTM A53. 150 psi galvanized malleable

iron screwed fittings, ANSI B16.3, ANSI B31.8. 2-1/2" through 4": May be screwed pipe as above or welded pipe as below. Welded: Schedule 40 black steel pipe, ASTM A53. Standard weight carbon steel welding fittings, long radius ells, ANSI B16.9.

- b. Inside Building - Below Grade to Five Feet Outside Building: Same as Inside Building and All Above Grade. Provide sleeves and vents acceptable to administrative authority.
- c. Outside Building - Below Grade: Polyethylene pipe and fittings, ANSI B31.8, ASTM D2513, where allowed by administrative authority, Driscopipe 6500, Dupont Aldyl "A", Plexco. Otherwise, piping shall be coated schedule 40 steel, ASTM A53.

3. Valves and Specialties:

a. Valves:

- (1) General: Manufacturer's model numbers are listed to complete description. Equivalent models of Crane, Kitz, Milwaukee, Nibco, Stockham, Walworth or Watts are acceptable. All valves of a particular type or for a particular service shall be by the same manufacturer. Butterfly valves may be substituted for 2-1/2" and larger gate valves above grade; see specification below. Provide a minimum of two operating "T" handles for underground valves for each underground system where valves are required. The lengths of the handles are dependent upon the depth of the valves and the ability of the handles to fully open and/or close the valves. At least one "T" handle for each system shall be on site at the beginning of the installation of a particular system for emergencies, and the Construction Manager shall have access to these "T" handles and valves.
- (2) Gate Valve: 2" and Smaller: All bronze. Non-rising stem. Threaded bonnet. Wedge disk. Malleable iron handwheel. 200 psi CWP. Nibco T-113-LF. 2-1/2" and Larger: Iron body, bronze mounted. Non-rising stem. Resilient wedge disk. 200 psi CWP. Flanged or AWWA hub end as applicable. Nibco F-619-RWS. Underground valves shall have square operating nut.
- (3) Butterfly Valve: Ductile iron threaded lug body. Aluminum bronze disk. EPDM molded-in liner and seals. 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. Nibco LD-2000.
- (4) Check Valve: Lead-free bronze swing check, regrinding. 200 psi CWP. Nibco T-413-Y-LF. For vertical applications use lead-free bronze, spring-loaded, lift-type. Nibco T-480-Y-LF.
- (5) Ball Valve: Full port. Lead free brass body, cap, stem, disk and ball. Screwed connection. Lever handle. PTFE seat and stem packing. Min. 400 psi CWP. CSA-US and UL listed. Nibco T-FP-600A-LF.
- (6) Plug Valve: Valves in gas piping systems must be UL or CSA listed for gas distribution. Eccentric bronze or nickel

plated semi-steel plug. Semi-steel body. Bronze bushings. Buna-N-rings. 175 psi WOG. KeyPort Valve Series 400. 2" and smaller above grade may be listed full port ball valves, except in publicly accessible locations. Apollo, Jomar, Nibco.

- (7) Valve Box: Precast reinforced concrete. Cast iron lid marked for service. Christy F8 in foot traffic areas; G5 in roadways. Provide with PVC pipe extension down to top of pipe.

b. Instruments:

- (1) Thermometer: 3" dial. Stainless steel case. Back or bottom connected as required. 1/2" NPT. 20F-240F, 2F divisions for hot water. 25F-125F, 2F divisions for chilled water. 2" insertion length. Allowance to be made for insulation thickness. For installations over 7 feet above finish floor, provide digital thermometer with remote reader. Marshalltown, Moeller, Taylor, Tel Tru, Winters.
- (2) Thermometer Well: Brass well. Suitable for thermometer above. Provide 2" extension at insulated pipes.

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. Unions for copper piping shall be copper or lead free cast bronze. Anvil. Size 2-1/2" and Larger: Grooved pipe, synthetic gasket, malleable iron housing. EPDM gasket, NSF 61 rated. Victaulic Style 77, Gruvlok.
- (3) Dielectric Coupling: Insulating union or flange rated for 250 psig. Wilkins DUXL Series.
- (4) Shock Absorber: Multiple bellows. All stainless steel construction. Designed and applied in accordance with PDI WH201. Amtrol, Smith, Wade, Zurn.

D. Drain Piping (including Condensate): Same as inside building cold water piping. Piping at ground mounted units shall be galvanized steel.

- 1. Condensate Drain Piping for Condensing Gas Fired Equipment: Solid wall schedule 40 CPVC piping with solvent weld fittings from equipment to neutralizing kit. Schedule 40 galvanized steel, ASTM A53 downstream of neutralizing kit. If no neutralizing kit, piping shall be CPVC to point of discharge.

E. Flue and Intake Piping (Condensing Gas Fired Equipment): Schedule 40 CPVC piping with Schedule 40 CPVC solvent weld fittings. Install per equipment manufacturer's instructions.

F. 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, Anvil, 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, Anvil, 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/ft² lead instead of galvanized steel. For single-ply roofing, use the roofing manufacturer's recommended flashing material.

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 to 140°F, thickness shall be 1" for pipe sizes less than 1"; 1-1/2" thickness for pipe sizes 1" and 1-1/2"; 2" thickness for 2" and larger. See Title 24, Part 6 "California Energy Code" for temperatures above 140°F. 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. Molded Closed Cell Vinyl (Piping Insulation Under Lavatories and Sinks): Fully molded closed cell vinyl, 1/8" thick, minimum. Thermal conductivity shall not exceed 1.17 BTU-in/hr-ft²-°F at an average temperature of 73°F. Weep hole in cleanout nut enclosure. Hinged cap over valve to allow access for servicing. Out of sight nylon fastening system and internal ribs on drain insulation to provide air gap (Lav-Guard Only). Truebro Lav-guard, McGuire Pro Wrap, Plumberex.

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, Just, Kohler, T&S Brass, Willoughby or Zurn are acceptable. For drainage fixtures, equivalent models of Josam, Mifab, Smith, Wade 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.
- D. Caulking: Caulk fixtures with white G.E. "Sanitary SCS1700", mildew resistant silicone sealant with EPA listed anti-microbial.

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. Gas: Gas burning equipment shall be furnished with 100% safety gas shut-off, intermittent pilot ignition, and shall be CSA (US) or AGA certified.
 - b. 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. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be manual reset, and shall have H-O-A switches and auxiliary contacts. 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. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip-proof, NEMA B design on pumps, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction, unless otherwise noted. Design shall limit starting inrush current and running current to values shown on drawings. Motors 1 horsepower and larger shall be the premium efficiency type, tested according to IEEE Standard 112, Method B. Motors exposed to weather shall be TEFC. Vertical motors with exposed fans shall have rain caps.
 - d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.
 - e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.
 - f. 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. Water Heater: Natural gas fired. Minimum 92% thermal efficiency. Shall be design certified by CSA for 180°F application. Tank shall be lined with Vitraglas® vitreous enamel and shall have a bolted hand hole cleanout. Tank shall have four extruded magnesium anode rods installed in separate head couplings. Water heater shall be equipped with stainless steel cold water inlet, Hydrojet® Sediment Reduction System. Heater shall be insulated with Non-CFC foam. Water heater shall be equipped with an electronic ignition system, an ASME rated T&P relief valve and a premix closed combustion system for direct venting using either 3" or 4" CPVC vent pipe. Factory assembled and tested. Water heater shall be approved for zero inch clearance to combustibles. A digital LCD display shall be integrated into the front and be an adjustable electronic thermostat to any temperature up to 180°F. A recycling Energy Cut Off (E.C.O.) shuts off all gas in the event of an overheat condition. Certified at 300 PSI test pressure and 150 PSI working pressure. Design certified by CSA International, ANSI standard Z-21.10.3, for up to 180°F application as an Automatic Storage Heater. Neutralizing kit. Bradford White.
- D. 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.
- E. Electric Drinking Fountain: Wall hung. Provide steel mounting brackets. Stainless steel basin. Removable grid drain. Chrome plated brass bubbler with automatic flow regulator and self-closing valve. Non-ferrous evaporator. Lead solder shall not be used. Hermetic compressor with automatic reset overload protection. Air cooled condenser. Adjustable thermostat. UL listed. ARI certified. Elkay, Haws, Sunroc.

2.5 GREASE INTERCEPTOR:

- A. Precast reinforced concrete grease interceptor designed and constructed in accordance with California Code of Regulations, Title 24. 24" manholes with gas tight cast iron ring and bolted cover. See schedule on drawings for tank sizing, inlet and outlet sizing and number of manholes. Jensen Precast, M.C. Nottingham, Pro-Cast.

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 Architect. 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.

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. For situations where this is not practical or where valves are greater than 10' above the floor, chain wheel operators shall be provided. Chain shall extend down to 7' above the floor. All such installations must have prior review by the Engineer.

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, Nibco 707-3-5,

to a Holdrite Model #SB1 bracket; 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
6	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.
- 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 2019 CBC Section 714.
- 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 Tap: Provide tee for instrument well. Minimum size of pipe surrounding well shall be 1-1/2". Mount on side of pipe.

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 12" 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. Piping with less than 24" of cover outside building walls shall be cast iron.
- 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 1/2", 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 as indicated on drawings. Only equipment mounted on vibration isolators shall be connected with flexible connections.
- E. Gas Piping: Installation shall comply with CPC and NFPA 54 (National Fuel Gas Code). Shall be pitched to drain to drip legs at low points where other than dry gas conditions exist. No unions shall be installed except at connections to equipment. Provide shutoff and dirt leg (sediment trap) at each equipment connection. Only equipment mounted on vibration isolators shall be connected with flexible connectors. Under floor piping shall be sleeved and vented. Plastic pipe and fittings shall be joined in accordance with manufacturer's recommendations. Metal to plastic transition fittings shall be installed at all transitions. Provide 14-gage insulated tracer wire secured to pipe at 10' intervals with nylon ties. Terminate tracer 6" above grade at both ends.

Odor Fade Warning – The odorant in propane (LP) and natural gas is colorless and the intensity of its odor can fade under some circumstances. Contact the utility company for more information.

Submit installer training certification from polyethylene piping manufacturer certified trainer, include copy of trainer's certification. Training shall have been completed no more than 6 months prior to starting work.

- F. 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, except in equipment rooms, piping shall be galvanized steel. P&T relief and water heater drain piping shall be galvanized steel. Provide secondary drain piping where required.

- G. Plastic 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.
- H. Flue and Intake Piping: Flue and Intake piping shall be installed in accordance with the equipment's CSA or UL listing and the manufacturer's instructions.

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 140F 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 or other areas subject to freezing (i.e. ventilated attics, uninsulated exterior soffits, etc.) shall be insulated same as hot water piping. Cover with aluminum jacketing where exposed to weather. Short lengths of pipe and valves may be wrapped with insulating tape, 50% overlap. Cover valves to stem. Apply at least two coats of protective finish where exposed to weather.
- C. Piping Insulation Under Lavatories and Sinks: Exposed water piping, water stops and drain piping under lavatories and sinks shall be insulated with 1/8" thick molded closed cell vinyl. Installation shall be in accordance with manufacturer's instructions.

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. Fixtures mounted on carriers shall bear against stop nuts, clear of wall surface. Caulk fixtures against walls with white G.E. "Sanitary SCS1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).
- D. Floor Mounted Fixtures: Shall be provided with proper support plates. Caulk floor mounted fixtures with white G.E. "Sanitary SCS1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).
- 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 Architect. 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. Drains (Including Condensate): Similar to Sanitary Sewer.
 - 3. Storm Drain: 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. Gas Piping: Maintain 100 psig air pressure for 4 hours.
4. Backflow Preventer: All backflow preventers shall be tested according to manufacturer's recommendations and the USC Cross Connection Control and Hydraulic Research Manual (8th Edition). Testing shall be performed by an AWWA Certified Backflow Prevention Assembly Tester. Contractor shall certify in writing to the Architect the date which backflow preventers were tested and by whom test was witnessed.

3.6 DISINFECTION:

- A. Disinfect all domestic water piping in accordance with 2016 CPC Section 609.9, 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 Architect. During procedure signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, one set of water samples shall be collected by Contractor for bacteriological analysis in presence of Inspector. If the water fails the bacteriological test, Contractor shall disinfect the piping again and pay for any retesting required, at no additional cost to owner. Bacteriological testing results shall be obtained by Contractor and delivered to the Owner through the Architect before project completion. Contractor shall include copy of Bacteriological Test Results at closeout with operation and maintenance manuals.

END OF SECTION

SECTION 230000 - GENERAL MECHANICAL PROVISIONS

PART 1: - GENERAL

1.1 GENERAL CONDITIONS:

- A. The preceding General and Special Conditions and Divisions 00 and 01 requirements shall form a part of this Section with the same force and effect as though repeated here. The provisions of this Section shall apply to all of the Sections of Divisions 21, 22 and 23 of these Specifications and shall be considered a part of these sections.

1.2 CODES AND REGULATIONS:

- A. All work and materials shall be in full accordance with current rules and regulations of all 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:
 - 1. California Code of Regulations (CCR):
 - a. Title 8, Industrial Relations
 - b. Title 24, Part 1, Administrative Regulations
 - c. Title 24, Part 6, California Energy Code, 2019 Edition
 - d. Title 24, Part 11, California Green Building Code, 2019 Edition
 - 2. California Building Code - CBC - 2019
 - 3. California Mechanical Code - CMC - 2019
 - 4. California Plumbing Code - CPC - 2019
 - 5. California Fire Code - CFC - 2019
 - 6. California Electrical Code - CEC - 2019
 - 7. Air Diffusion Council - ADC
 - 8. American Gas Association - AGA
 - 9. Air Movement and Control Association - AMCA
 - 10. American National Standards Institute - ANSI
 - 11. Air Conditioning and Refrigeration Institute - ARI
 - 12. American Society of Heating, Refrigerating, and Air Conditioning Engineers - ASHRAE
 - 13. American Society of Mechanical Engineers - ASME
 - 14. American Society for Testing and Materials - ASTM
 - 15. American Water Works Association - AWWA
 - 16. Cast Iron Soil Pipe Institute - CISPI
 - 17. National Electrical Manufacturers Association - NEMA
 - 18. National Fire Protection Association - NFPA
 - 19. National Sanitation Foundation - NSF
 - 20. Occupational Safety and Health Act - OSHA
 - 21. Plumbing and Drainage Institute - PDI
 - 22. Sheet Metal and Air Conditioning Contractors National Association - SMACNA
 - 23. Underwriters' Laboratory - UL

1.3 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. Permits for equipment connected to a particular system are to be considered as part of the work included under each system. All charges or fees for service connections, meters, etc. shall be included in the work.

1.4 COORDINATION OF WORK:

- A. 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. Verify the proper voltage and phase of all equipment with the electrical plans. 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 Architect and 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.

1.5 GUARANTEE:

- A. Guarantee shall be in accordance with the General Conditions. 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 Architect. Equipment that is started and operated prior to acceptance shall have the guarantee extended to cover that period. Owner guarantee shall start at acceptance.

1.6 QUIETNESS:

- A. Piping, ductwork and equipment shall be arranged and supported so that vibration is a minimum and is not transmitted to the structure.

1.7 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.

1.8 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.

1.9 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.

1.10 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.

1.11 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 (this includes deferred approval items). Material or equipment shall not be ordered or installed until written review is processed by the Engineer. Any item omitted from the submittal shall be provided as specified without substitution. 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.
 - 4. Drawings shall be submitted in both hard copy and electronic form, electronic files shall be in their native format (i.e. DWG for AutoCAD, RVT for Revit, etc).
 - 5. Electronic Submittals: Where allowed by Division 01, electronic submittals are acceptable providing the following requirements are met. Electronic submittals which do not comply with these requirements will be rejected.

- a. Submittal shall be a single file in PDF format, with bookmarks for table of contents and each tab, and sub-bookmarks for each item.
 - b. All text shall be searchable (except text that is part of a graphic).
 - c. Submittal shall include all items noted in 1 through 3 above, except a binder is not required.
 - d. Electronic submittals shall be processed through normal channels. Do not submit directly to the Engineer unless the Engineer is the prime consultant for the project.
 - e. Contractor shall provide Owner and Owner's Representative with hard copies of the final submittal. Coordinate exact number required with Owner through Architect/Engineer.
- B. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and features desired (where equipment is scheduled on the drawings, any equipment submitted other than scheduled equipment is considered a substitution). Unless otherwise noted, alternate manufacturers may be submitted for review by the Engineer. 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.

1.12 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.

1.13 SCHEDULING OF WORK:

- 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 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.

1.14 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 Architect.

1.15 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 trenches 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. Native soil may be used where allowed by Geotechnical (Soils) Report. Where native soil is used, trenching for gravity drain pipe shall be done using a laser-level and trencher.
 - 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.

1.16 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. Johns-Manville. Protective coating shall be extended 6" above surrounding grade.

1.17 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. Key and cylinder lock (except quick-opening type for Emergency Gas Shutoff Valve). 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"

1.18 CONCRETE ANCHORS:

- A. Steel bolt with expansion anchor requiring a drilled hole - powder driven anchors, adhesive anchors and concrete screws are not acceptable. Re-use of screw anchor holes shall not be permitted. Minimum concrete embedment shall be 4-1/2 diameters. Minimum spacing shall be 12 diameters center to center and 6 diameters center to edge of concrete. Post-installed anchors in concrete used for component anchorage shall be pre-qualified for seismic application in accordance with ACI 355.2 and ICC-ES AC193. Post-installed anchors in masonry used for component anchorage shall be pre-qualified for seismic applications in accordance with ICC-ES AC01. Maximum allowable loads for tension and shear shall be as determined by Calculation in compliance with ACI 318-14, Chapter 17, and the anchor's ICC or IAPMO evaluation report. Hilti, Powers, Red Head.

1.19 EQUIPMENT ANCHORING:

- A. All equipment shall be securely anchored in accordance with ASCE 07-16, Chapter 13, as amended by CBC Section 1616A.1. All equipment mounted on concrete shall be secured with a concrete anchor as specified above at each mounting point.

1.20 SEISMIC SUPPORT AND RESTRAINT DESIGN SERVICE:

- A. All mechanical systems (equipment, ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance with the "Seismic Restraint Components for Suspended Utilities", 2016 Edition, as published by Mason West Inc., OPM-0043-13, or other OSHPD pre-approved system, and in accordance with ASCE 07-16, Chapter 13, as amended by CBC Section 1616A.1. Brace spacing shall be reduced by 50% for cast iron, plastic, no-hub, or other non-ductile piping. A copy of this manual shall be kept on site at all times during construction.
- B. Contractor shall obtain the services of a Seismic Design service to provide engineered seismic supports and restraints for the project. Mason Industries, or pre-approved equal. **Note: Use of the "12 inch rule" does not exempt Contractor from this requirement.**
 - 1. All seismic designs, including designs using OSHPD pre-approvals, shall be submitted as project specific engineered designs sealed and signed by a licensed California structural engineer. All seismic designs shall include project / application specific seismic design demand calculations. Said seismic design demand calculations shall account for seismic forces in all applicable direction including axial, lateral, vertical tension, vertical compression, etc. Designs shall account for prying, eccentricity, uneven loading, weak axis bending, etc.
 - 2. Seismic restraint layouts for piping, ductwork and electrical raceways shall be furnished on shop drawings or added to the contractor's shop drawings and shall include:
 - a. The number, size and location of seismic braces.
 - b. Maximum support loads and seismic loads at the seismic brace locations.
 - c. Reference to specific details or pages from the OSHPD pre-approved system (OPM).
 - d. **If use of the "12 inch rule" is intended by Contractor, design service shall verify locations where it is intended to be used is feasible and specifically identify these locations on the shop drawings, along with appropriate hanger details.**
 - 3. Installations not addressed by the OPM approval must be designed, detailed and submitted along with the shop drawings.
 - 4. Submit seismic restraint layout drawings and special details for approval of the project structural engineer per the requirements listed in the OSHPD pre-approval (OPM).
 - 5. Seismic restraint layout drawings shall bear the stamp and signature of the registered professional structural engineer licensed in the state of California who designed the layout of the braces.

1.21 ASBESTOS CONTAINING MATERIALS:

- A. No materials or material coatings containing asbestos shall be allowed on this project.

1.22 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) and identifies the area or space served by the equipment. Provide 1/2" high lettering - white on black background. Nameplates shall be permanently secured to the exterior of the unit.

1.23 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.
- B. At the end of each work day, the Contractor shall cover all open ends of piping and ductwork with protective plastic.

1.24 ACCEPTANCE TESTING:

- A. The Contractor shall perform, document and submit all acceptance testing as required by California Code of Regulations, Title 24, and as noted on the Certificate of Compliance form (MECH-1C), where applicable. Submit a copy of the documentation to the Engineer for review (hardcopy or electronic), prior to submitting to Administrative Authority.

1.25 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.

1.26 RECORD DRAWINGS:

- A. The Contractor shall obtain one set of blue line 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, underfloor duct, etc. within the building shall be recorded by offset distances from building walls. As part of the Contractor's overhead expense, request a full set of reproducible drawings to 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.

PART 2: - PRODUCTS (not used)

PART 3: - EXECUTION (not used)

END OF SECTION

SECTION 230001 - HEATING, VENTILATING AND AIR CONDITIONING

PART 1: - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS:

- A. The General Mechanical Provisions, Section 230000, shall form a part of this Section with the same force and effect as though repeated here.

1.2 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. Air distribution system.
 - 2. All equipment as shown or noted on the drawings or as specified. Furnish motor starters except where motor control centers are used. Coordinate with Division 26.
 - 3. Circulating water system.
 - 4. System energy balance.
 - 5. Coordinate with Section 230923 (Direct Digital Control (DDC) System for HVAC) regarding location and installation of system sensors and to provide simultaneous start-up.
 - 6. Refrigeration system.
 - 7. Coordinate and cooperate with commission agent as required by Section 01 91 13.
- B. Work Specified Elsewhere:
 - 1. Line voltage power wiring, motor starters in motor control centers, disconnect switches and installation of all starters are included in the Electrical Section, unless otherwise noted.
 - 2. Connection of gas and condensate drains to equipment.
 - 3. Concrete and reinforcing steel unless specifically called for in the drawings or specifications.
 - 4. Painting unless specifically called for in the drawings or specifications.
 - 5. Carpentry.
 - 6. Direct digital control (DDC) system for HVAC.

PART 2: - PRODUCTS

2.1 PIPING MATERIALS:

- A. Hot Water Piping:
 - 1. Above Grade:
 - a. 2" and Smaller: Schedule 40 black steel pipe, ASTM A53. 150 psi black malleable iron screwed fittings, ANSI B16.3. Piping at floor mounted unit ventilators may be hard drawn Type L copper, soldered joints, 95-5 solder.
 - b. 2-1/2" Through 4": Screwed pipe as above -OR- welded or grooved pipe as below.

- c. Welded: Schedule 40 black steel pipe, ASTM A53. Standard weight carbon steel welding fittings, long radius ells, ANSI B16.9. Joints may be grooved pipe unions, EPDM gaskets. Grinnell, Gruvlok, Victaulic.
2. All Below Grade: All Below Grade: Preinsulated. Steel pipe core - A106/A53, Grade B, seamless standard weight for pipe sizes 1-1/2" and smaller; A53, Grade B, ERW, standard weight for pipe sizes 2" and larger. Foamed polyurethane insulation, see paragraph 2.2, B for minimum insulation thicknesses. HDPE or PVC jacket. Pipe and fittings shall be socket welded for pipe sizes 1-1/2" and smaller, and butt welded for pipe sizes 2" and larger. Perma-Pipe/Ricwil, Rovanco, Thermacor, Thermal Pipe Systems.
3. Valves and Specialties:
 - a. Valves:
 - (1) General: Manufacturer's model numbers are listed to complete description. Equivalent models of Crane, Milwaukee, Nibco, Stockham, Walworth, as well as Grinnell, Gruvlok and Victaulic for grooved joint systems, are acceptable. All valves of a particular type or for a particular service shall be by the same manufacturer. Butterfly valves may be substituted for 2-1/2" and larger gate valves above grade; see specification below.
 - (2) Gate Valve: Provide 2" extension necks at insulated pipes, where required. 2" and Smaller: All bronze. Rising stem. Union bonnet. Wedge disk. Screwed connection. Malleable iron handwheel. Class 125. Stockham B-105. 2-1/2" and Larger: Iron body, bronze mounted. Non-rising stem. Wedge disk. Class 125. 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) Plug Valve: Eccentric bronze or nickel plated semi-steel plug, semi-steel body, bronze bushings, Buna-N-rings. 175 psi WOG. KeyPort Valve Series 400.
 - (5) Check Valve: Non-slam, lift type. Replaceable bronze seat, disk and bushings. Stainless steel helical spring. Disk guided at top and bottom. Flow area through valve shall exceed cross sectional area of pipe. 150 psi WOG. CPV, Mueller Steam Specialty. 2" and Smaller: Shall be screwed brass with hand lapped bronze disk. 2-1/2" and Larger: Shall be iron body, wafer or flanged with resilient Buna-N or TFE facing on seat.
 - (6) Ball Valve: Full port. Bronze body, cap, stem, disk and ball. Screwed connection. Lever handle. TFE seat. O-ring seals. 300 psi WOG. Apollo, Nibco, Jomar.

- (7) Globe Valve: All bronze. Renewable TFE disk. Screwed connection. Malleable iron handwheel. Union bonnet. Class 150. Stockham B-22.
- (8) Valve Box: Pre-cast reinforced concrete. Cast iron lid marked for services. Christy F22 in foot traffic areas; G5 in roadways.
- b. Instruments:
 - (1) Thermometer: 1" dial. 5" stainless steel stem suitable for use with Pete's Plug. Plastic case. 25-125°F with 1°F divisions for chilled water. 0-220°F with 2°F divisions for hot water. Tel-Tru, Winters.
 - (2) Thermometer: 3" dial. Stainless steel case. Back or bottom connected as required. 1/2" NPT. 20-240°F, 2°F divisions for hot water, 25-125°F, 2°F divisions for chilled water. 2" insertion length. Allowance to be made for insulation thickness. Marshalltown, Moeller, Taylor, Tel Tru, Winters.
 - (3) Thermometer Well: Brass well. Suitable for 3" dial thermometer above. Provide 2" extension at insulated pipes.
 - (4) Pressure Gage: Phosphor bronze tube. Bronze bushed. 1% accuracy. Cast aluminum case. 3-1/2" white dial. Adjustable pointer. Operating pressure at midscale. 1/4" NPT brass socket. Provide brass porous core pressure snubber and gage cock. Trerice, Weksler, Winters.
 - (5) Gage Cock: Lever handle brass cock. 1/4" NPT connections. Provide 2" extension at insulated pipes.
 - (6) Instrument Well: Suitable for temperature sensing element. Coordinate with supplier of temperature controls.
- c. Miscellaneous Specialties:
 - (1) Pressure Relief Valve: ASME rated fully automatic, reseating pressure relief valve sized in accordance with energy input. 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) Combination Reducing/Relief Valve: Iron body. Diaphragm operated. Brass internal parts. Reducing valve shall have a built-in strainer and check valve and have a field adjustable range of 10-25 psi and a 125 psi maximum working pressure. Relief valve shall be set at 30 psi. Bell and Gossett No. F-3.
 - (4) Balancing Cock: Calibrated all bronze balancing/shutoff valve or cock. Screwed connections. Memory stop. Position indicator. Drain connection. Taps for differential pressure gage, with check valves or shutoffs. 125 psi working pressure. Internal seals. Preformed insulation block. Armstrong, FlowSet by Flow Design, Inc., Grinnell, Tour and Andersson, Victaulic.
 - (5) Strainer: "Y" type, 125 psi. Machined seats. Stainless steel screens. Provide gate valve blowoff with hose threads. Bailey, Mueller Steam Specialty.

- 2" and Smaller: Screwed bronze body. Perforation size 0.057".
- 2-1/2" and Larger: Flanged iron body, perforation size 1/16".
- (6) Dielectric Coupling: Insulating union, flange or waterway fitting rated for 250 psig. EPCO, Clearflow.
 - (7) Expansion Tank: Pressurized diaphragm type or bladder type, as shown on drawings. Welded steel, ASME code construction with ASME stamp and certification, 125 psi, 240°F. Sealed elastomer diaphragm or heavy duty butyl bladder. Pre-charged with air to initial fill pressure of system. Base or saddle as required for mounting. Removable access cover for bladder type. Sight glass for diaphragm type (hot water service only). Amtrol, Taco.
- B. Refrigerant Piping: Hard drawn Type ACR copper, dried and capped. Wrought copper fittings, silver alloy brazed, 1100°F, Silfos. Size 3/8" and smaller may be refrigerant tube, ASTM B280.
- C. Flue and Intake Piping (Condensing Gas Fired Equipment): Schedule 40 CPVC piping with Schedule 40 CPVC solvent weld fittings. Install per equipment manufacturer's instructions.
- D. 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 recommendations. Felt liner for copper piping. Hanger and rod shall have galvanized finish. B-Line, Anvil, Unistrut.
 - b. Insulation Support: Calcium silicate insulation, 100 psi, or heavy density fiberglass, 100 psi. Insulation thickness equal to adjoining pipe insulation. Steel support shield or saddle. Provide vapor barrier for chilled water piping. Insulation and/or vapor barrier shall extend 1" beyond steel support. Pipe hanger in accordance with paragraph 1 above. Increase hanger size per manufacturer's recommendation. B-Line, Pipe Shields, Inc., Uni-Grip.
 - c. 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.
 - d. 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, Anvil, Unistrut.
 - 2. Flashing: Flashing for piping through roof shall be prefabricated galvanized steel roof jacks with 16" square flange around pipe. Provide clamp-on storm collar and seal water tight with mastic. Maintain dielectric separation between copper and galvanized materials. For cold process built-up roof, material shall be 4 lb/ft² lead instead of galvanized steel. For single-ply roofing, use the roofing manufacturer's recommended flashing material.

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 50°F. 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 140°F and less, thickness shall be 1" for pipe sizes less than 1", 1-1/2" thickness for pipe sizes 1" and larger. For hot water piping over 140°F, thickness shall be 1-1/2" for pipe sizes less than 1-1/2", 2" thickness for pipe sizes 1-1/2" and larger. CSG Insulation Corp., Knauf, Johns-Manville, Owens-Corning.
- C. Fiberglass Blanket: Unfaced, 1-1/2" thick. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft²-°F at a mean temperature of 50°F. 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. Reinforcing Mesh: 10 x 10 strands per square inch. Polyester or fiberglass. Mast-a-Fab, Vimasco Elastafab or Childers Chil Glas #10.
- F. Vapor Barrier Coating: Childers CP-34, Foster 30-65. Permeance shall be 0.08 perms or less at 45 mils dry as tested by ASTM F1249.
- G. Lagging Adhesive: Childers CP-50A MV1, Foster 30-36.
- H. Aluminum Jacketing: Aluminum pipe and fitting jacketing, 0.016" thickness for straight pipe. 0.024" thickness for fittings. Integral moisture barrier. Stucco-Embossed finish. Provide pre-fabricated aluminum strapping and seals by same manufacturer. ITW or RPR.
- I. Outdoor Weather Barrier Mastic: Childers CP-10/11, Foster 46-50.
- J. Metal Jacketing Sealant: Childers CP-76, Foster 95-44.
- K. 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.
- L. Foamed Plastic: Rubber based elastomeric preformed pipe insulation. Thermal conductivity shall not exceed 0.27 Btu-in/hr-ft²-°F at a mean temperature of 70°F. 1/2" thick. Provide adhesive by same manufacturer. Armacell Armaflex.

2.3 DUCTWORK MATERIALS:

- A. General: All ductwork 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. Shall comply with 2019 CMC.
- B. Metal Ductwork: Metal ductwork shall be galvanized sheet steel, lock forming quality, ASTM A-653, with gage and construction to match SMACNA Standard for pressure required (26 gage minimum).
 - 1. Grease Bearing Exhaust Ductwork: Exhaust ducts from Type I grease hoods shall be constructed in accordance with Chapter 5 of the California Mechanical Code with 16 gage galvanized steel or 18 gage stainless steel. All joints shall be made with a continuous weld.
- C. Flexible Ductwork: Insulated flexible ductwork. One pound per cubic foot glass fiber insulation, 1-1/2" thick (R-6), 2" thick (R-8) where ductwork is outside the building thermal insulation envelope. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft²-°F at a mean temperature of 75°F. Seamless metalized reinforced polyester vapor barrier jacket. Continuous internal liner bonded to galvanized steel wire helix. Duct shall be capable of continuous operation at 1-1/2" of positive water static pressure and 4,000 ft/min air velocity. Duct shall comply with NFPA 90A. JP Lamborn.
- D. Duct Sealants: All Joints Exposed to Weather: Sealant shall be water based, Foster 32-19/32-17, Childers CP-146/148, United Duct Sealer WB or G.E. "SilPruf" SCS2000 silicone sealant. Joints Not Exposed to Weather: Fiber reinforced. White in color. Foster 32-17, Childers CP-148, Design Polymerics DP1030, Hardcast Versa-Grip 181, Hardcast CCWI-181.

2.4 AIR TERMINALS AND DUCT FITTINGS:

- A. Grilles: (Grilles, Registers, Diffusers and Louvers)
 - 1. Information on Drawings: Refer to Grille Schedule on the drawings for the list of grilles. Manufacturer's model numbers are listed to complete the description Titus. Equivalent models of Anemostat or Krueger are acceptable. Refer to the floor plans for neck size, CFM, air diffusion pattern and fire damper, if required.
 - 2. Performance: Submit complete performance data (throw, pressure drop, noise level, etc.) for all grilles proposed, other than those scheduled. Testing shall be in accordance with ANSI/ASHRAE 70-1991. If, according to the certified data of the manufacturer of the proposed units, the sizes indicated on the drawings will not perform satisfactorily, the units shall be reselected by the Contractor for the proper diffusion, spread, pressure drop, throw and noise level.
 - 3. Frame and Accessories: All supply, return, and exhaust grilles shall not have an opposed blade volume control damper unless otherwise noted. All surface mounted grilles shall have a perimeter gasket and flanged edge. All grilles shall have frames suitable for mounting in the surfaces designated by the architectural drawings. Key or screwdriver operated, no slide bars.
 - 4. Finish: All ceiling and wall grilles and all louvers shall have a paintable white finish unless otherwise noted. Interior components (everything behind the face plate) shall be flat black. Floor grilles shall have an anodized aluminum finish unless otherwise noted.

- B. Branch Duct Volume Damper: Volume control damper (VCD) in rectangular ducts shall be as follows: Opposed blade, 6" maximum blade width, 16-gage blade, 48" maximum length, nylon or oil impregnated bronze bearings, 1/2" diameter pin shaft, 16-gage channel frame, actuating rod and linkage out of air stream. VCD in round duct shall be as follows: Damper blade full height of branch and 1" less than branch width. All branch dampers shall have regulator with stamped steel handle, spring loaded shaft nut, cast body and serrated self-locking die cast core. Regulator for horizontal ducts overhead shall be mounted on sides or bottom of ducts. Secure a 12" length of brightly colored plastic ribbon to handle for ease of location. Where rectangular or round ductwork is insulated, slit insulation to allow handle to protrude. Ventlok 641 (with 607 end bearing for round ducts).
- C. Extractor: Curved blade turns in adjustable position rigid frame. Tuttle and Bailey Deflectrol.
- D. Turning Vanes: Double wall, hollow metal, air foil shape. Spacing in accordance with manufacturer's recommendations. Aero Dyne HEP.
- E. Flexible Connection: UL listed neoprene coated 30 ounce fiberglass cloth. 3" metal, 3" fabric, 3" metal. Ventglas.
- F. Variable Air Volume Terminal:
1. General: Pressure independent, single-duct electric powered variable volume terminal. Scheduled pressure drop is maximum allowable at inlet static at design conditions. Provide integral flow taps and calibration chart on each unit. Performance testing shall be in accordance with ARI Standards. Titus.
 2. Casing: Welded 24-gage galvanized steel. Provide hanger holes on four corners. Interior insulation shall be 1/2" thick, 1-1/2 lb. density glass fiber with high density facing. Insulation shall be UL listed and in compliance with NFPA 90A. Maximum allowable leak rate 2% at 3" WC.
 3. Controls: Provide integral cross flow velocity sensor furnished and installed at the factory.
 4. Coils: Units specified with hot water coils shall have factory installed access panel upstream of the coil and shall have coil with 1/2" O.D. seamless copper tube with 0.017" tube wall. Fin tube expanded into fin collar for permanent bond. Leak tested at 300 psig.
 5. Sound Performance Data: Discharge sound and radiated sound levels shall not exceed the published sound levels of the terminals which were used as the basis of design. The manufacturer shall submit discharge sound and radiated sound data in both sound power level (ref: 10-12 watts) in octave bands and noise criteria (NC) ratings. Testing shall be in accordance with ARI Standards.
- G. Fire/Smoke Damper: California State Fire Marshal approved. UL listed and labeled indicating fire rating. Hour rating as required by the rating of the wall, ceiling, floor, etc. in which it is installed. Combination fire/smoke dampers shall have normally-closed, non-stall factory electric actuator rated for 250°F (min.) and shall be Leakage Class II.

- H. Duct Access Door:
1. Rectangular: Insulated double wall door. Full piano hinge. Cam latch. Pressure rating to match application. Air Balance, Ductmate.
 2. Round: Three layers of stamped steel. Inside panel shall consist of two layers of metal which are spotwelded together along the rim, encapsulating high density fiberglass insulation (25/50 rated). Closed cell neoprene gasket bonded to the inside of the door. Zinc plated conical springs installed between the inner and outer door. Polypropylene molded knobs with threaded metal inserts. Knobs shall be easily turned by hand and shall be UL94HB listed. Zinc plated carriage bolts, clinched and sealed to the inner door. Provide self adhesive template for the exact size of duct opening. Pressure rating to match application. Ductmate.
- I. Kitchen Hood:
1. General: Factory fabricated in accordance with CMC Chapter 5 and State codes. Install with bottom of hood 48" above cooking surface. UL labeled. Greenheck.
 2. Materials: Unless otherwise noted, all visible elements of the hood shall be constructed of stainless steel, 18 gage, type 304, with a No. 4 polished finish. All seams shall have a liquid tight, continuous weld, ground smooth and polished. Provide factory stainless steel enclosure panels.
 3. Filters: Filters shall be fixed baffle type. 20 gage stainless steel construction. Filters shall be furnished with handles. Blank panels shall be installed where required to symmetrically space filters. 20 gage full length stainless steel filter rack with continuous, removable, stainless steel grease trough.
 4. Lights: UL listed vapor proof lights. Conduit and conductors shall be pre-wired to a J-box on top of canopy.

2.5 DUCTWORK INSULATION MATERIALS:

- A. General: All ductwork 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. Fiberglass Blanket: **Installed** thermal resistance at a mean temperature of 75°F shall meet or exceed indicated value. 3/4 lb/ft³ or 1 lb/ft³, **R-6** where ductwork is within the building thermal insulation envelope. 3/4 lb/ft³ **R-8** where ductwork is outside the building thermal insulation envelope and/or above the roof. Faced with glass reinforced foil laminated to Kraft paper. Certainteed, Knauf, Johns-Manville, Owens-Corning.
- C. Acoustic Lining: Glass fiber duct liner. **Installed** thermal resistance at a mean temperature of 75°F shall meet or exceed indicated value. One side coated with anti-microbial coating to prevent mold growth and fiber erosion up to 6000 ft/min. Average noise reduction coefficient of 0.80. 1.5 lb/ft³ density. 1" thick (**R-4.2**) where ductwork is within the building thermal insulation envelope. 2" thick (**R-8**) where ductwork is outside the building thermal insulation envelope and/or above the roof. Certainteed, Knauf, Johns-Manville, Owens-Corning.
- D. Bonding Adhesive: Design Polymerics DP2501, Foster 85-60.

- E. Fire Resistive Duct Wrap: Nominal 1-1/2" thick, 6 lb/ft³ high-temperature fiber blanket thermal insulation encapsulated in a fiberglass-reinforced aluminized polyester foil. Grease Duct Listing Standards (Double Wrap) ASTM E 2336 / ICC-ES AC101. Ventilation Duct Listing Standard (Single Wrap) – ISO 6944. 3M Fire Barrier Duct Wrap 615+.

2.6 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. Where Architectural screening is indicated, equipment shall not extend above or beyond screening. 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. Gas: Gas burning equipment shall be furnished with 100% safety gas shut-off, intermittent pilot ignition, and be CSA (US) certified, except that boilers shall be CSA (US) certified or UL listed.
 - b. 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.
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. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be manual reset, shall have H-O-A switches and auxiliary contacts. 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. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip proof, NEMA B design on pumps and fans, NEMA C on reciprocating equipment, sealed ball bearing,

- three-phase induction unless otherwise noted. Design shall limit starting inrush current and running current to values shown on drawings. Motors 1 horsepower and larger shall be the premium efficiency type, tested according to IEEE Standard 112, Method B. Motors exposed to weather shall be TEFC. Motors in a fan air stream shall be TEFC or TEO. Vertical motors outdoors shall be ODP or TEFC and shall have rain caps.
- d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.
 - e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.
 - f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.
6. Fan Selection - Static Pressure: Unless otherwise noted, pressure scheduled as external static pressure (ESP) includes all ductwork and accessory losses external to the unit housing. Unless otherwise noted, pressure scheduled as total static pressure includes all ductwork, filter, coil, cabinet, damper and other accessory losses. Unless otherwise noted, pressure scheduled as duct static pressure includes all supply and return ductwork and accessory losses external to the unit housing and plenum (as applicable). The allowance for filter losses is 0.3" WC, unless otherwise noted. Submit itemized static pressure losses for all components.
7. Filters:
- a. General: Tested and rated in accordance with ASHRAE Standard 52.2 and Title 24, C.C.R. Furnish and install one complete change of all filters after air balance is completed and prior to acceptance.
 - b. Filter Media: 2" media. MERV-13. Clean filter resistance 0.41" water at 500 fpm. Throw-away frame. Class 2. Camfil AP-Thirteen.
8. Screens: All duct or louver openings to the outside shall be covered with 1/2", 16-gage, galvanized wire mesh screen.
9. Mixing Dampers: Opposed blade, 16-gage. Six-inch maximum blade width, 48" maximum length. Nylon or oil impregnated bronze bearings. One-half inch diameter pin shaft. 16-gage channel frame. One percent maximum leakage at 4" WC in accordance with AMCA 500 for outside air dampers. Actuating rod out of air stream. Arrow.
10. Sound Ratings: Shall be in accordance with ASHRAE 36 - 72. Sound ratings shall not exceed scheduled values.
11. Drives: Unless noted as direct connected, drives shall be V-belt, rated at 150% of motor horsepower. Multiple drive belts shall be matched set. Drive sheaves shall be dynamically balanced, adjustable, range +/- 10%, selected at mid range. Adjustable relative movement shall be lockable to shaft. Belts shall be aligned within 1-1/2 degrees at all times. Open drives shall be provided with OSHA approved open mesh belt guards. Belt guards exposed to weather shall be weatherproof enclosure with louvered face for adequate ventilation. Driving motor shall be mounted on adjustable rails. T.B. Woods, Browning. Submit RPM range of driven machine with drive selection.

- B. Air Conditioning Unit:
1. General: Self-contained heating/cooling unit designed for outdoor installation. Factory assembled and tested. Refer to Paragraph 2.6A for general requirements. Provide all starters and relays required for operation. 24-volt control circuit from integral transformer. Weatherproof cabinet, galvanized steel with enamel finish. Outside air inlet. Drain pan. Multivane centrifugal supply fan. ARI certified. Gas equipment AGA certified. Carrier.
 2. Refrigeration: Sealed hermetic compressor with internal vibration isolating mount. Crankcase heater, high/low pressure switch, recycling timer. Air-cooled condenser with propeller fan. Non-ferrous finned coil. Low ambient control to 45°F. Single phase units shall have compressor start assist kit. 5-year extended warranty on compressor(s).
 3. Heat: Natural gas fired. Low NOx. Aluminized or ceramic coated welded steel heat exchanger. Electric ignition. Automatic gas valve. Fan and limit controls.
- C. Indoor/Outdoor Unit:
1. General: Refer to Paragraph 2.6A for General Requirements. Completely assembled and factory tested. Provide all starters and relays required for operation. All components by same manufacturer. Mitsubishi.
 2. Outdoor Unit:
 - a. Compressor: Sealed hermetic rotary compressor with vibration isolator mountings. Crankcase heater, suction line accumulator, recycling timer. High and low head pressure/temperature protection. Motor overload protection, low ambient feature to 20°F cooling mode. High and low side service valves. Recycling timer. Single phase start assist kit. 5-year extended warranty.
 - b. Fan and Coil: Finned tube non-ferrous coil. Propeller type fan, 1200 RPM maximum, direct drive. Totally enclosed motor, overload protected, permanently lubricated, resiliently mounted.
 - c. Cabinet: Weatherproof, factory paint.
 3. Indoor Unit:
 - a. Supply Fan: Direct drive, multi-speed forward curve, centrifugal fan, resiliently mounted. Thermally protected motor.
 - b. Indoor Coil: Copper tube, aluminum fin, DX coil.
 - c. Condensate Pan: Install under complete coil area with drain connections.
 - d. Filter: Washable media. Class 2 or better.
 4. Controls: Microprocessor control containing temperature selection, room temperature indication, malfunction alarm, power failure automatic restart safety, and emergency operation function.
- D. Exhaust and Supply Fans:
1. General: All exhaust and supply fans shall be tested according to AMCA Standard 210 in an AMCA registered laboratory. Fans exposed to weather shall have ventilated weatherproof housing over motor and drive assembly. Refer to Paragraph 2.6A for general requirements. All direct drive fans shall be provided with unit mounted speed controllers, unless otherwise noted. All motors 1 horsepower and larger shall be the premium efficiency type.

2. Roof Fan (Direct): Spun aluminum, roof mounted, direct driven, downblast centrifugal exhaust ventilator. Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners and stainless steel fasteners on cap. Spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. Aluminum base shall have continuously welded curb cap corners for maximum leak protection. Discharge baffle shall have a rolled bead for added strength. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections. Motor shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Unit shall bear an engraved aluminum nameplate. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. An aerodynamic aluminum inlet cone shall be provided for maximum performance and efficiency. Motor shall be heavy duty type with permanently lubricated sealed bearings and furnished at the specified voltage, phase and enclosure. Backdraft damper. Greenheck.
3. Utility Fan (Belt): Single width, single inlet, backward inclined steel wheel, belt driven centrifugal vent set. UL 762 listed. Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The entire fan housing shall have continuously welded seams for leakproof operation. Heavy gauge steel construction. Fan housing shall be field rotatable to any one of eight discharge positions and shall have a minimum 1-1/2 inch outlet discharge flange. Bearing support shall be bolted steel. Lifting lugs shall be provided for ease of installation. Unit shall bear an engraved aluminum nameplate. All steel fan components shall be coated with an electrostatically applied, baked polyester powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method. Wheel shall be steel centrifugal backward inclined, non-overloading flat blade type. Blades shall be continuously welded to the backplate and deep spun inlet shroud. Wheel hub shall be keyed and securely attached to the fan shaft. Wheel inlet shall overlap a one piece aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure. Blower shaft shall be AISI C-1045 hot rolled and accurately turned, ground and polished. Shafting shall be sized for a critical speed of at least 125% of maximum RPM. Bearings shall be heavy duty regreaseable ball or roller type in a cast iron pillowblock housing selected for a minimum L10 life in excess of 80,000 hours at maximum cataloged operating speed. Belts shall be oil and heat resistant, non-static Type 4L. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM. Greenheck.
4. Side Intake Filtered Supply Fan: Fan shall be a side intake, roof mounted, direct driven, filtered, centrifugal plenum supply fan. Fan shall be UL listed. Fan shall bear the AMCA certified ratings seal for sound and air performance. Fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18 gauge galvanized steel,

bolted to a minimum 16 gauge steel fan base with prepunched mounting holes. Unit shall be provided with a top cover and 1" washable permanent aluminum filters. Motor shall be mounted on rubber-in-shear vibration isolators. Unit shall be supplied with integral wiring box and receptacle. Unit shall bear an engraved aluminum nameplate. Wheel shall be centrifugal forward curved type, constructed of galvanized steel. Wheel shall be balanced in accordance with AMCA Standard 204-96. Motor shall be open drip proof type with permanently lubricated sealed bearings, built-in thermal overload protection, and furnished at the specified voltage, phase and enclosure. Greenheck.

E. Boiler

1. General: Natural Gas fired. Low NOx. Refer to paragraph 2.6A for general requirements. The boiler shall be constructed in accordance with California Code requirements. Boiler shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. Boiler shall have a fully welded 316L stainless steel, fire tube heat exchanger. There shall be a single pressure vessel. Multiple pressure vessels are not acceptable. Fire tube shall be capable of transferring 16,000 to 20,000 Btu's per tube. There shall be no banding material, bolts, gaskets or "O" rings in the heat exchanger construction. The fire tube shall be robotically welded to the tube sheets. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. Pressure drop shall be no greater than 3.2 psi at 180 gpm. The condensate collection basin shall be constructed of welded 316L stainless steel. The complete heat exchanger assembly shall carry a ten (10) year limited warranty. Lochinvar Knight OKN.
The boiler shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13 test standard for the U.S. and Canada. The boiler shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard and the minimum efficiency requirements of the latest edition of the AHRI BTS-2000 Standard as defined by the Department of Energy in 10 CFR Part 431. The boiler shall operate at a minimum of 93% thermal efficiency at full fire as registered with AHRI. The registered combustion efficiency must be equal or greater than the registered thermal efficiency. All models shall operate up to 98% thermal efficiency with return water temperatures at 70°F or below at 20°F temperature rise. The boiler shall be certified for outdoor and indoor installation.
2. Construction: The boiler shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The jacket shall be designed and sealed for outdoor installations. A vent system shall be supplied by the boiler manufacturer that is factory designed and outdoor rated. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided. The single burner shall be a premix design constructed of high temperature stainless steel with a woven metal fiber outer covering to provide modulating firing rates. The boiler shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to

provide modulating boiler firing rates for maximum efficiency. The boiler shall operate in a safe condition with gas supply pressures as low as 4 inches of water column. The burner flame shall be ignited by direct spark ignition with flame monitoring via a flame sensor. The boiler shall be equipped with leveling legs.

3. Controls: The boiler shall utilize a 24 VAC control circuit and components. The control system shall have a display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The boiler shall be equipped with a temperature/pressure gauge, high limit temperature control certified to UL353, ASME certified pressure relief valve, outlet water temperature sensor, return water temperature sensor, a UL 353 certified flue temperature sensor, outdoor air sensor, low water flow protection and built-in adjustable freeze protection.. The boiler shall feature the "smart system" control with a multi-colored graphic lcd display with navigation dial and soft keys for, password security, three loop temperature setpoints with individual outdoor air reset curves, pump delay with adjustable freeze protection, pump exercise, domestic hot water prioritization with dhw modulation limiting and usb pc port connection. The boiler shall be capable of controlling a variable speed boiler pump to keep a constant delta t at all modulation rates. The boiler shall have the capability to accept a 0-10 vdc input connection for bms control of modulation or setpoint, enable/disable of the boiler, variable system pump signal and a 0-10vdc output of boiler modulation rate. The boiler shall have a built-in "cascade" to sequence and rotate the while maintaining modulation of up to eight boilers without utilization of an external controller. The internal "cascade" function shall be capable of lead-lag, efficiency optimization, front-end loading, and rotation of lead boiler every 24 hours. The boiler shall have optional Modbus protocol and a gateway device which will allow integration with Lon or BACnet protocols. The boiler shall be equipped with two terminal strips for electrical connection. A low voltage connection board with 42 data points for safety and operating controls, i.e., Auxiliary Relay, Auxiliary Proving Switch, Alarm Contacts, Runtime Contacts, Manual Reset Low Water Cutoff, Flow Switch, High and Low Gas Pressure Switches, Tank Thermostat, Three Wall Thermostat/Zone Controls, System Supply Sensor, Outdoor Sensor, Building Management System Signal, Modbus Control Contacts and Cascade Control Circuit. A high voltage terminal strip shall be provided for supply voltage. The high voltage terminal strip plus integral relays are provided for independent pump control of the System pump, the Boiler pump and the Domestic Hot Water pump. Supply voltage shall be 120 volt / 60 hertz / single phase.
4. The BOILER shall have an independent laboratory rating for Oxides of Nitrogen (NOx) of 20 ppm or less corrected to 3% O₂. The manufacturer shall verify proper operation of the burner, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

F. Pumps:

1. General: Refer to Paragraph 2.6A for general requirements. Pumps shall be selected to be non-overloading at any point on the pump curve. Contractor shall include all costs required to field trim or change pump impeller, if necessary, to match design conditions. All motors 1 horsepower and larger shall be the high efficiency type. Bell and Gossett, Grundfos, PACO, Peerless, Taco.
2. Materials and Components: Enclosed bronze impeller hydraulically and dynamically balanced on shaft. Renewable bronze wear rings. Mechanical seals unless otherwise noted. Stainless steel shaft or steel shaft with bronze sleeve. Gray iron casing. Suction and discharge connections shall be 125 psi flanges tapped for pressure readings.
3. In-Line Centrifugal: In-line single stage, end suction centrifugal pump close coupled to motor. Pipe supported or cast iron support stand as indicated on drawings.

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 Architect. 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. Lines shall be adequately braced against vertical and lateral movement. Pipe sizes indicated on the drawings are nominal sizes unless otherwise noted. Pipe sizes shall not decrease in direction of flow, unless otherwise noted.
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 1100°F. 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. At equipment connections, valves shall be full size of upstream piping. Provide a shut-off valve at each point of connection to existing piping.
- 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. For situations where this is not practical or where valves are greater than 10' above floor, chain wheel operators shall be provided. Chain shall extend down to 7' above the floor. All such installations must have prior review by the Engineer.

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. Refer to drawings for additional requirements and attachment to structure. 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.

Pipe Size (In.)	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	8	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.

- b. Non-Insulated Piping: Support individual pipes with pipe hanger.
- c. Hot Water Piping: Support individual pipes with insulation support and pipe hanger. Install per manufacturer's recommendations.
- d. Refrigerant Piping: Support insulated refrigerant line with construction channel and sheet metal support saddle or Cooper B-Line Armafix clamps. 5' spacing. Use isolation shield for uninsulated pipe. When using pre-charged tubing, all changes of direction shall be made with bending tools producing neat uniform bends. Free

- hand bends will not be accepted.
 - e. 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 escutcheons where piping penetrates walls, ceilings, or floors in finished areas.
 - b. Pipe Sleeves: All piping passing through concrete or concrete block shall be provided with pipe sleeves. Allow 1" (nominal) clearance between sleeve and pipe or pipe insulation.
 - 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 2019 CBC Section 714.
 - d. Thermometer or Pressure Gage Tap: Provide tee for instrument well. Minimum size of pipe surrounding well shall be 1-1/2". Mount on side of pipe.
 - e. 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.
- B. Hot Water Piping: Provide shut-off valve for each building and at each connection to equipment. Before threading, welding or grooving any pipe, it shall have a cloth material of the proper size pulled through pipe to clean out any foreign material, and then a visual inspection through pipe to verify it is clean. Any process done to pipe end will require that pipe end be inspected inside before a fitting is fitted to pipe (to insure that cutting oil or pipe burrs are removed). Always have pipe threading machine sloped to prevent cutting oil from running into the pipe. Branch lines leaving horizontal lines shall leave on the horizontal or at an upslope of 45°, unless they are rising up to another horizontal line which will insure the pipe to remain air free. All high points in any part of the system shall have the means to purge air. Unless otherwise noted all vents shall be 1/4" petcocks with 1/4" copper tube discharge. Route tube to condensate pan, floor sink, etc. If a drain point is not available, terminate tube with a return bend to allow water to be collected. Before connection to equipment, all piping shall be thoroughly flushed with water. Only equipment mounted on vibration isolators shall be connected with flexible connection. The manufacturer of the underground piping system shall instruct the installer regarding the manufacturer's required installation procedures. The manufacturer shall also provide sufficient job-site inspection to insure that the work is being accomplished in accordance with the plans, specifications and manufacturer's requirements. Upon completion of the installation, a certificate shall be furnished to the Architect by the manufacturer of the system, certifying the installation was made in accordance with his requirements and in compliance with the plans and specifications.
- C. Refrigerant Piping: Pipe shall be cut square. Joint surfaces shall be thoroughly cleaned, fitted and erected before brazing. After installation, evacuate to 29 inches of mercury, ambient temperature during evacuation shall not be less than 70°F. After evacuation, fill with dry nitrogen to 250 psi and maintain for two-hour period without additional charge. After nitrogen test, purge with refrigerant charged through dryer and maintain holding charge in system and equipment. Refrigerant

pipng below grade shall be run in 4" (min.) PVC conduit with long radius ells. Seal ends of conduit watertight.

- D. Plastic 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.
- E. Flue and Intake Piping: Flue and Intake piping shall be installed in accordance with the equipment's CSA or UL listing and the manufacturer's instructions.

3.2 PIPING INSULATION INSTALLATION:

- A. Hot Water Supply and Return:
 - 1. General: All hot water supply and return piping (including all fittings and accessories) and all hot water equipment 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, solvent welded. Seal all joints with factory supplied pressure sealing vapor barrier tape with a 1-1/2" (min.) overlap on both sides of joint. Insulate all flanges, unions and valves except stems and operators.
 - 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 reinforcing mesh, one coat of lagging adhesive, and a final coat of vapor barrier coating.
 - 4. Pipe Hangers: Seal all joints at pipe hangers with vapor barrier tape.
 - 5. Piping Exposed to Weather:
 - a. All piping and fittings exposed to weather shall have, in addition to the above described insulation, an aluminum jacketing. Insulation at grooved pipe couplings shall be covered with aluminum flange fitting covers. Secure in place with factory supplied straps. Install all joints and seams to prevent water entry, seal with 1/8" bead of gray metal jacketing sealant.
 - b. For miscellaneous fittings for which aluminum jackets are not available or where proximity of fittings precludes a neat-appearing installation, the Contractor may cover the insulation with reinforcing mesh and at least two coats of outdoor mastic. Plastic fitting covers shall not be used where exposed to weather.
 - 6. 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. Do not install this jacket where it will be subjected to a temperature of 150°F or more such as immediately adjacent to boilers. In these locations install reinforcing mesh, one coat of lagging adhesive and a final coat of vapor barrier coating.
 - 7. Equipment: Hot water equipment with continuous circulation (pumps, heat

exchanger, etc.), shall be insulated with materials similar to those described in Paragraph 2.2. It shall be the Contractor's responsibility to provide adequate insulation weatherproofing for equipment exposed to the weather, and a neat-appearing installation. Submit materials and method of installation to Engineer for review.

- B. Refrigerant Piping: Cover piping with foamed plastic insulation. Longitudinal and end seams shall be thoroughly cemented with adhesive in accordance with manufacturer's recommendations. Cover all fittings, unions, valves and connections. Piping exposed to view shall be covered with PVC jacketing. Piping exposed to weather shall be covered with aluminum jacketing, seal all joints and seams with 1/8" bead of gray metal jacketing sealant.

3.3 DUCTWORK INSTALLATION:

A. General:

1. Standards: Unless otherwise noted, all ductwork shall be constructed and installed in accordance with current SMACNA Standards. Ductwork shall be built to a pressure classification equal to or greater than the maximum operating pressure at that point in the ductwork. A copy of these standards shall be maintained at the job site at all times. Duct work and accessories shall be installed in a manner to prevent vibration and rattling.
2. Access: Provide duct access doors as required to adjust equipment and dampers. Provide wall or ceiling access panels, or remote actuators as required where equipment and dampers are not otherwise accessible. Remote regulator shall be as detailed on drawings.
3. Flexible Connections: Connection of ductwork to any vibrating equipment shall be with 3" (min.) flexible connection. Install with ample slack and uniform gap. There shall be no metal to metal contact across flexible connection. Flexible connections exposed to weather shall have a protective sheet metal cover.
4. VAV System: For all variable air volume (VAV) systems, the supply ductwork between the fan discharge and the VAV boxes shall be constructed per SMACNA standards to a pressure level equal to the maximum shut-off pressure the fan can generate. All joints in this ductwork shall be sealed with duct sealant in accordance with manufacturer's recommendations. Install VAV boxes with four diameters of straight duct on up-stream side.
5. Flanges and Escutcheon: Where ductwork penetrates walls, ceilings, or floors, furnish and install flange or escutcheon of same material as duct.

B. Low Velocity-Low Pressure (up to 2,000 ft/min and up to 2.0 in water):

1. Sheet Metal Ductwork:
 - a. Ells: Ells with less than standard radius and square ells shall be fitted with turning vanes.
 - b. Tees: Tees in supply ductwork shall be straight tap-in with extractor or 45 degree take-off as shown on drawings. Grilles or branches in supply ductwork shall be a minimum of 8 duct diameters downstream of tees.
 - c. Duct Joints and Seams: All joints and seams which are not exposed to weather shall be sealed airtight with duct sealant. All joints and

seams exposed to weather shall be sealed air and water tight with silicone sealant. (See Part 2 of this Specification). All joints on metal ductwork not exposed to weather but exposed to view shall be sealed air tight with grey duct sealant.

- d. Dampers: Install volume control damper and damper regulator in all branch ducts.
- 2. Flexible Glass Fiber Ductwork: The use of flexible duct is limited to the last 5 feet of each branch duct (i.e. one 5 foot section of flexible duct may be used to connect the grille to the sheet metal branch duct). No joints are permitted in this 5' length. Hangers shall be 4" wide metal straps spaced to prevent sagging, 42" spacing maximum. Insert 6" wide fiberglass pad between duct and hanging strap. Joints shall be installed with stainless steel or nylon draw bands, Duro Dyne Dyn-O-Tie. Minimum turn radius shall be in accordance with SMACNA Standards (turn radius of duct centerline not less than 1.5 times the duct diameter).
- 3. Grease Bearing Exhaust Ductwork: Horizontal portions of the duct shall slope down towards the hood at 1/4" per foot (min.) unless the total horizontal length exceeds 75 feet, then the slope shall be 1" per foot (min.). Provide access panels at changes of direction as required by CMC. Drains shall be provided at low points in horizontal ducts per 2016 CMC 510.1.3. Horizontal ducts shall be provided with access in accordance with 2016 CMC Section 510.3.3.

3.4 AIR TERMINALS AND DUCT FITTINGS INSTALLATION:

- A. General: Unless otherwise noted, all air terminals and duct fittings shall be installed in accordance with current SMACNA Standards. Terminals and fittings shall be installed in a manner to prevent vibration and rattling. Metal surfaces exposed to view behind grilles and registers shall be painted flat black.
- B. Fire/Smoke Damper: Shall be installed in accordance with the manufacturer's recommendations. Provide access doors as required, label per CBC. Manufacturer's instructions shall be available to the inspecting authorities. Shall be tested according to State Fire Marshal requirements.

3.5 DUCTWORK INSULATION INSTALLATION:

- A. General: Insulate all sheet metal supply, return and outside air intake ductwork except as noted below. Insulation shall be continuous through walls and floors except at fire dampers.
- B. Where Insulation Is Not Required: Do not insulate factory-insulated ducts or casings, acoustic lined ducts, fibrous glass ducts, underground ductwork, supply or return ductwork exposed to view in the space that it serves, or exhaust ductwork.
- C. Concealed Ductwork: Wrap concealed ductwork including outside air intakes with fiberglass blanket lapped 2" minimum. Secure with staples 4" on centers maximum on straight runs and 3" maximum at elbows and fittings. Insulation on bottom of ducts wider than 36" shall also be secured with mechanical fasteners at 24" on center.

- D. Acoustic Lining: Unless otherwise indicated, all supply and return ductwork in equipment rooms, all ductwork exposed to weather and other ducts as indicated on drawings, shall have acoustic lining. Do not acoustic line outside air intakes. Where acoustic lining is installed, increase each sheet metal dimension to accommodate lining and maintain clear inside duct dimensions shown on drawings. Apply lining with bonding adhesive in accordance with manufacturer's recommendations and also secure with mechanical fasteners in accordance with SMACNA Standards. Seal exposed edges of lining with bonding adhesive.
- E. Fire Resistive Wrapped Ducts: Where indicated on drawings, ductwork shall be covered with fire resistive duct wrap. Install in accordance with it's UL or Omega Point Laboratories Design number (as applicable) and the Manufacturer's Installation Instructions.

3.6 EQUIPMENT INSTALLATION:

- A. General: It shall be the responsibility of the equipment installer to ensure 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. All equipment shall be installed level.
- 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.
- C. Pumps: Install pumps with a minimum of 8 diameters of straight pipe at the pump suction unless a suction diffuser is installed. Sufficient clearance to wall or other obstructions shall be provided so that motor and rotating parts can be removed without disassembly of volute or piping. Anchor bolt configuration shall be compatible with this method of removal. Pedestal mounted pumps shall have their bases grouted. Realign pump and motor according to Hydraulic Institute Standards after grouting and connection of piping.
- D. Boiler: Installation shall be in accordance with California Code of Regulations, Title 8, Industrial Relations. Where required, permit for system operation shall be obtained and permanently posted at installation.

3.7 TESTS AND ADJUSTMENTS:

- A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Architect. 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.
- B. Piping Tests:
 - 1. General: Tests may be made in sections, however, all connections between sections previously tested and new section must be included in the new test. 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. Water Piping: Maintain 100 psig water pressure for 4 hours.

3.8 SYSTEM ENERGY BALANCE:

- A. Scope: Provide the services of an independent test and balance agency to test, adjust and balance, retest and record performance of the system to obtain design quantities as specified. The agency must prove that they have no affiliation with any equipment manufacturer, design engineer, installing contractor, or any other party which might lead to a conflict of interest, in order to provide an unbiased, third party system balance and report.
- B. Qualifications: Prior to commencing work, the agency shall be reviewed by the Engineer and shall be certified by the Associated Air Balance Council, National Environmental Balancing Bureau or Testing, Adjusting and Balancing Bureau. The agency shall provide documentation of having successfully completed at least five projects of similar size and scope.
- C. Instruments: All instruments shall be accurately calibrated; calibration histories shall be available for examination. Application of instrumentation shall be in accordance with AABC, NEBB or TABB standards.
- D. Submittals: Include in shop drawings copies of forms to be used for testing and balancing showing all data which is to be recorded. Three copies of completed balance report shall be submitted to and reviewed by the Mechanical Engineer prior to the final mechanical construction review.
- E. Procedure - General: Procedure shall be in accordance with Associated Air Balance Council's "National Standards for Field Measurements and Instrumentation - Total System Balance", Volume Two, No. 12173, or equivalent NEBB or TABB standards. System shall be in full, continuous operation during test. Balanced quantities shall be plus 10%, minus 0% of design quantities. All nameplate data, manufacturer, model and serial numbers shall be recorded for each item tested.
- F. Extended Warranty: The test and balance agency shall include an extended warranty of 90 days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck or resetting of any item or items in test report. The agency shall provide technicians to assist the Engineer in making any tests he may require during this period of time.
- G. Air Balance Procedure (For Each Air Handling System):
 1. All air filters shall be clean when air balance is performed.
 2. Provide a sketch of the equipment showing exactly where all pressure readings were taken.
 3. Adjust blower RPM to design requirements.
 4. Record motor full load amperes.
 5. Make pitot tube traverse of main supply and return ducts and obtain design CFM at fans.
 6. Record system static pressures, inlet and discharge.
 7. Record filter quantity, size(s) and pressure drop across filter(s) at each filter bank.

8. Adjust system for design CFM recirculated air.
 9. Adjust system for design CFM outside air.
 10. Record entering air temperatures. (DB heating, DB and WB cooling.)
 11. Record leaving air temperatures. (DB heating, DB and WB cooling.)
 12. Adjust all main supply and return air ducts to design CFM.
 13. Adjust all zones to design CFM, supply and return.
 14. Adjust all diffusers, grilles and registers to plus 10%, minus 0% of design requirements.
 15. Adjust CFM at all exhaust fans, make-up units, etc. (high and low speed, where applicable). Record applicable data from items 1 through 11 above.
 16. Each grille, diffuser and register shall be identified as to location.
 17. Verify proper diffusion pattern for all ceiling grilles and that all sidewall grilles are set for 5 degrees upward deflection unless otherwise noted. Make a notation of any that are not set properly.
 18. Size, type and manufacturer of diffusers, grilles, registers and all tested items shall be identified and listed. Manufacturer's ratings shall be used to make required calculations on all items.
 19. Readings and tests of diffusers, grilles, and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.
 20. In cooperation with the control manufacturer's representative, set adjustments of automatically operated dampers to operate as specified. Testing agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.
 21. All diffusers, grilles and registers shall be adjusted for required air patterns and to minimize drafts.
 22. As a part of the work of this contract, THE AIR CONDITIONING CONTRACTOR shall make any changes in pulleys, belts and dampers or the addition of dampers required for correct balance as recommended by air balance agency, at no additional cost to Owner.
 23. Set, test and adjust packaged heating/cooling unit economizer operation in cooperation with controls contractor. Record minimum and maximum outside and exhaust airflows.
- H. Water Balance Procedure (For Each Pumping System):
1. Set valves for maximum coil flow.
 2. Remove and clean all strainers.
 3. Examine water in system and determine if water has been treated and cleaned.
 4. Check expansion tanks to determine that they are properly charged and that the system is completely full of water. Bleed air from system.
 5. Set operating temperatures of all equipment to design requirements.
 6. Air balance must be complete before water balance begins.
 7. Adjust pumps to design flow by use of differential pressure gage calibrated in feet of water.
 8. Adjust water flow through all equipment to design flow.
 9. Record leaving and return water temperatures at all equipment. Reset to correct design temperature.
 10. Record water temperatures at inlet side of coils. Record rise or drop of temperatures from source.
 11. Balance all coils for design flow and mark settings on flow controllers.
 12. After coils are balanced, recheck settings at all equipment and readjust if

- required.
13. Record pressure drop through coils, and reset to design flow. Set pressure drop across bypass valve to match coil full flow pressure drop.
 14. Record the following at each coil:
 - a. Inlet water temperatures.
 - b. Leaving water temperatures.
 - c. Pressure drop across coil.
 - d. Pressure drop across bypass valve.
 15. Record pump suction and discharge pressures at operating condition and also with pump discharge valve completely closed.
 16. Record running amperage of pump motor at operating condition and also with pump discharge valve completely closed.
 17. Record water metering device readings.

END OF SECTION

SECTION 230923 – DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents. Consult the above for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.

1.2 CONTROL SYSTEM DESCRIPTION

- A. The Building Automation System shall be an extension of the existing Trane Tracer system.
- B. The Building Automation System shall be as indicated on the drawings and described in these specifications. System must be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed in the equipment manufacturer's factory as specified in those sections. The intent of the BAS is to integrate all mechanical equipment into one system for global monitoring, control, and alarming associated with the building. It is the BAS manufacturer's responsibility to provide all the design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency.

1.3 APPROVED CONTROL SYSTEM MANUFACTURERS

- A. Trane (tie in to City of Clovis enterprise Trane controls system)

1.4 QUALITY ASSURANCE

- A. BAS Manufacturer Qualifications
 - 1. The BAS manufacturer shall have an established business office within 50.00 miles of the project site and must provide 24 hours/day, 7 days/week response in the event of a customer warranty or service call.
 - 2. The BAS Manufacturer shall have factory trained and certified personnel providing all engineering, service, startup, and commissioning field labor for the project from their local office location. BAS manufacturer shall be able to provide training certifications for all local office personnel upon request.
 - 3. The BAS shall be provided by a single manufacturer and this manufacturer's equipment must consist of operator workstation software, Web-based hardware/software, Open Standard Protocol hardware/software, Custom application Programming Language, Graphical Programming Language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (i.e., sensors, valves, dampers, actuators, etc.) need not be manufactured by the BAS manufacturer listed in this specification.

4. Independent representatives of BAS manufacturers are not acceptable. BAS vendor must be corporate owned entity of BAS manufacturer.

1.5 CODES AND STANDARDS

- A. Codes and Standards: Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
 1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
 2. National Electrical Code -- NFPA 70.
 3. Federal Communications Commission -- Part J.
 4. ASHRAE/ANSI 135-2012 (BACnet) - (System Level Devices) - Building Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.
 5. ASHRAE/ANSI 135-2012 (BACnet) - (Unit Level Devices) - Unit Controllers shall conform to the listed version of the BACnet specification in order to improve interoperability with various building system manufacturers' control systems and devices.
 6. EIA-709.1 LonTalk Standard and EIA 901.2 (LonMark Certification) - (Unit Level Devices) - Custom Application Controllers and Application Specific Controllers shall use FTT-10A transceivers and support the LonTalk communication protocol utilizing Standard Network Variable Types (SNVT) as defined by Echelon Corporation. This standard communication protocol provides interoperability with hundreds of other various building system manufacturers' control systems and devices.

1.6 SYSTEM PERFORMANCE

- A. Performance Standards. The BAS system shall conform to the following:
 1. Graphic Display. The system shall display a graphic with a minimum of 20 dynamic points. All current data shall be displayed within 10 seconds of the operator's request.
 2. Graphic Refresh. The system shall update all dynamic points with current data within 10 seconds.
 3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 5 seconds. Analog objects shall start to adjust within 5 seconds.
 4. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current within the prior 10 seconds.
 5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 10 seconds.
 6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
 7. Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The

controller shall scan and update the process value and output generated by this calculation at this same frequency.

8. Multiple Alarm Annunciations. All workstations on the network shall receive alarms within 5 seconds of each other.
9. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.
 - a. Table 1: Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	$\pm 0.5^{\circ}\text{C}$ [$\pm 1^{\circ}\text{F}$]
Ducted Air	$\pm 1.0^{\circ}\text{C}$ [$\pm 2^{\circ}\text{F}$]
Outside Air	$\pm 1.0^{\circ}\text{C}$ [$\pm 2^{\circ}\text{F}$]
Water Temperature	$\pm 0.5^{\circ}\text{C}$ [$\pm 1^{\circ}\text{F}$]
Delta -T	$\pm 0.15^{\circ}\text{C}$ [$\pm 0.25^{\circ}\text{F}$]
Relative Humidity	$\pm 5\%$ RH
Water Flow	$\pm 5\%$ of full scale
Air Flow (terminal)	$\pm 10\%$ of reading *Note 1
Air Flow (measuring stations)	$\pm 5\%$ of reading
Air Pressure (ducts)	± 25 Pa [± 0.1 "W.G.]
Air Pressure (space)	± 3 Pa [± 0.01 "W.G.]
Water Pressure	$\pm 2\%$ of full scale *Note 2
Electrical Power	5% of reading *Note 3
Carbon Monoxide (CO)	± 50 PPM
Carbon Dioxide (CO ₂)	± 50 PPM

Note 1: (10%-100% of scale) (cannot read accurately below 10%)

Note 2: for both absolute and differential pressure

Note 3: * not including utility supplied meters

1.7 SUBMITTAL REQUIREMENTS

- A. BAS manufacturer shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software being provided for this project. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications. Five (5) copies are required. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats once they have been approved and as-built drawings have been completed.
- B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the BAS manufacturer of furnishing quantities required based upon contract documents.
- C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with the specifications or which is deemed valuable in documenting and understanding the system to be installed.
- D. Submit the following within 90 days of contract award:
 1. A complete bill of materials of equipment to be used indicating quantities, manufacturers and model numbers.

2. A schedule of all control valves including the valve size, pressure drop, model number (including pattern and connections), flow, CV, body pressure rating, and location.
 3. A schedule of all control dampers including damper size, pressure drop, manufacturer, and model number.
 4. Provide all manufacturers' technical cut sheets for major system components. When technical cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Include:
 - a. Building Controllers
 - b. Custom Application Controllers
 - c. Application Specific Controllers
 - d. Operator Workstations
 - e. Portable Operator Terminals
 - f. Auxiliary Control Devices
 5. Provide proposed Building Automation System architectural diagram depicting various controller types, workstations, device locations, addresses, and communication cable requirements
 6. Provide detailed termination drawings showing all required field and factory terminations, as well as terminal tie-ins to DDC controls provided by mechanical equipment manufacturers. Terminal numbers shall be clearly labeled.
 7. Provide points list showing all system objects and the proposed English language object names.
 8. Provide a sequence of operation for each controlled mechanical system and terminal end devices.
 9. Provide a BACnet Protocol Implementation Conformance Statement (PICS) for each BACnet system level device (i.e. Building Controller & Operator Workstations) type. This defines the points list for proper coordination of interoperability with other building systems if applicable for this project.
 10. Provide LonMark Certification and functional profile SNVT's for unitary - level controllers (i.e. chillers, RTU's, AHU's, Terminal VAV boxes, FCU's, UV's, etc.) for interoperability with other building systems if applicable for this project.
- E. Project Record Documents: Upon completion of installation, submit three (3) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:
1. Project Record Drawings - These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .dwg and .pdf drawing files shall be provided.
 2. Testing and Commissioning Reports and Checklists signed off by trained factory (equipment manufacturers) and field (BAS) commissioning personnel.
 3. Operating and Maintenance (O & M) Manuals - These shall be as-built versions of the submittal product data. In addition to the information required for the submittals, Operating & Maintenance manual shall include:
 - a. Names, address and 24-hour/7-day per week telephone numbers of Contractor personnel managing and installing equipment, along

- with service personnel responsible for supporting the ongoing warranty and services of the control system.
 - b. Procedures for operating the BAS including logging on/off, alarm management, generation of reports, trends, overrides of computer control, modification of setpoints, and other interactive system requirements.
 - c. Description of the programming language including syntax, statement descriptions, algorithms, calculations, point database creation and modification, program creation and modification, and operator use of the editor.
 - d. Explanation of how to design and install new points, new DDC controllers, and other BAS hardware.
 - e. Preventative Maintenance and calibration procedures; hardware troubleshooting; and hardware repair and/or replacement procedures.
 - f. Documentation of all software program logic created for Custom Programmable Controllers including the overall point database. Provide one set of magnetic media containing files of the software and point database.
 - g. One set of electronic media containing files of all operator color graphic screens for the project.
 - h. A list of recommended spare parts including pricing, manufacturer, supplier, and part numbers.
 - i. Documentation, installation, and maintenance information for all third-party hardware/software products provided including personal computers, printers, hubs, sensors, valves, etc.
 - j. Original issue media for all software provided, including operating systems, programming language, operator workstation software, and graphics software.
 - k. Licenses, Guarantee, and Warranty documents for all equipment and systems.
 - l. Recommended preventive maintenance procedures for all system components including a schedule of tasks (inspection, cleaning, calibration, etc.) and task descriptions.
- F. Training Manuals: The BAS manufacturer shall provide a course outline and copies of training manuals at least two weeks prior to the start of any corporate training class to be attended by the Owner.

1.8 WARRANTY REQUIREMENTS

- A. Warrant all work as follow s:
1. BAS system labor and materials shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. BAS failures during the warranty period shall be adjusted, repaired, or replaced at no charge to the Owner. The BAS manufacturer shall respond to the Owner's request for warranty service within 24 hours of the initiated call and will occur during normal business hours (8AM-5PM).
 2. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the BAS is operational, and has been tested and

accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of the warranty period.

3. Operator workstation software, project specific software, graphics, database, and firmware updates shall be provided to the Owner at no charge during the warranty period. Written authorization by the Owner must be granted prior to the installation of these updates.
4. The BAS manufacturer shall provide a web-accessible Users Network for the proposed System and give the Owner free access to question/answer forum, user tips, upgrades, and training schedules for a one-year period of time correlating with the warranty period.

1.9 SYSTEM MAINTENANCE

- A. Perform Building Automation System preventative maintenance and support for a period of 1 year (beginning the date of substantial completion).
 1. Make a minimum of 2 complete Building Automation System inspections, in addition to normal warranty requirements. Inspections to include:
 - a. System Review – Review the BAS to correct programming errors, failed points, points in alarm, and points that have been overridden manually.
 - b. Seasonal Control Loop Tuning – Control loops are reviewed to reflect changing seasonal conditions and / or facility heating and cooling loads.
 - c. Sequence of operation verification – Systems all verified to be operating as designed and in automatic operation. Scheduling and setpoints are reviewed and modified.
 - d. Database back-up e. Operator coaching
 2. Technician shall review critical alarm log and advise Owner of additional services that may be required.
 3. Technician shall provide a written report to Owner after each inspection.
- B. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

1.10 OWNERSHIP OF PROPRIETARY MATERIAL

- A. Project specific software and documentation shall become the Owner's property upon project completion. This includes the following:
 1. Operator Graphic files
 2. As-built hardware design drawings
 3. Operating & Maintenance Manuals
 4. BAS System software database
 5. Controller application programming databases
 6. Application Specific Controller configuration files
 7. Required Licensed software

PART 2 PRODUCTS

2.1 MATERIALS

- A. Use new products that the manufacturer is currently manufacturing and that have been installed in a minimum of 50 installations. Do not use this installation as a

product test site unless explicitly approved in writing by the Owner or the Owner's representative. Spare parts shall be available for at least five years after completion of this contract.

2.2 COMMUNICATION

- A. This project shall be comprised of a high-speed Ethernet network utilizing BACnet/IP communications between System Controllers and Workstations. Communications between System Controllers and sub-networks of Custom Application Controllers and/or Application Specific Controllers shall be as defined below.
 - 1. Each System Controller shall perform communications to a network of Custom Application and Application Specific Controllers using BACnet/MSTP (RS485) as defined by the BACnet standard.
 - a. Each System Controller shall function as a BACnet Router to each unit controller providing a unique BACnet Device ID for all controllers within the system.
- B. The Controls Contractor shall provide all communication media, connectors, repeaters and network switches routers necessary for the high-speed Ethernet communications network.

2.3 OPERATOR INTERFACE

- A. A dedicated PC shall not be required to access the Enterprise or Building operator web interfaces.
- B. Enterprise Operator Web Interface
 - 1. System Description:
 - a. The Enterprise operator interface is a web-based, systems integration solution that gives facility managers an online, enterprise-wide view and control over of all their buildings and systems, from any device with a web browser on the network. (PC, laptop, tablet, smart phone).
 - b. The system shall collect and display data from other systems via BACnet® IP, providing users the critical information needed to make enterprise-wide decisions for optimized performance
 - c. The Enterprise operator web interface shall be accessible via a web browser without requiring any "plug-ins" (i.e. JAVA Runtime Environment (JRE), Adobe Flash).
 - d. The Enterprise operator interface software shall be installed on a local server provided by the building Owner. The server hardware and any System level controllers are to reside on the building Owner's network. (Note: The central server hardware, associated server operating system software, network cabling and switches is to be provided by others).
 - e. If the Enterprise operator interface software is being provided as a cloud-based service, the manufacture shall include a two-year cloud base service as part of this contract.
 - 2. Building Health Operator Interface View

- a. The Enterprise operator web interface shall provide a standard building health view that provides visual indication of which buildings have issues
 - b. The Enterprise operator web interface building health will display the summary information including number of active alarms for today, number of devices off-line, number of hot/cold spaces.
 - c. The Enterprise operator web interface shall provide a direct link from any building health card to a building summary view that displays: active alarms for today, current chiller plant stats (if applicable), air handler status, and spaces that are too hot/cold.
 - d. The Enterprise operator web interface shall provide the ability to group, filter, and sort the list of buildings
 - e. The Enterprise operator web interface shall allow a user to save filtering and grouping options as their default view
 - f. The Enterprise operator web interface shall allow a user to disable the building health display for any building.
- 3. Customizable Navigation Tree
 - a. The Enterprise operator web interface shall include a fully customizable navigation tree that shall allow an operator to do the following:
 - (1) Move and edit any of the nodes of the tree.
 - (2) Move entire groups to any area of the tree
 - (3) Change the name of any node in the tree
 - (4) Create custom nodes for any page in the web interface including: graphics, data log views, schedules, and dashboards
 - (5) Support navigation from multi-building to single building view
 - (6) Provide the ability to assign graphics to any node in the tree
 - (7) Ability to create folders and assign and change hierarchy of nodes of the tree
- 4. Mobile User Interface
 - a. The Enterprise operator mobile friendly pages will allow the operator to accomplish the following tasks:
 - (1) System Status
 - (2) Equipment status
 - (3) Space Status
 - (4) Standard Equipment graphics
 - (5) Override editable points
 - (6) Override occupancy
 - (7) Acknowledge Alarms
 - (8) Comment on Alarms
 - (9) Delete Alarms
 - (10) View, edit, and change schedules
 - (11) View mobile friendly dashboards
 - (12) View custom graphics
 - (13) Quickly change from mobile view to full desktop mode
- 5. Equipment & Application Pages
 - a. The Enterprise operator web interface shall include standard pages for all equipment and applications. These pages shall allow an

operator to obtain information relevant to the operation of the equipment and/or application, including:

- (1) Animated Equipment Graphics for each major piece of equipment and floor plan in the System. This includes:
 - (a) Each Chiller, Air Handler, VAV Terminal, Fan Coil, Boiler, and Cooling Tower. These graphics shall show all points dynamically as specified in the points list.
 - (b) Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions. Graphics shall be capable of launching other web pages.
 - (2) Alarms relevant to the equipment or application without requiring a user to navigate to an alarm page and perform a filter.
 - (3) Historical Data (As defined in Data Log section below) for the equipment or application without requiring a user to navigate to a Data Log page and perform a filter.
 - (4) View of all custom graphical programming for supported controllers in real time
 - (5) View and management of all points for equipment and applications
 - (6) Support documents that have been assigned for that equipment
 - (7) Live data view for any selected points
 - (8) Touch friendly design for all action buttons, navigation, and spacing
6. System Graphics. Enterprise operator web interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using colors to represent zone temperature relative to zone set point.
- a. Graphic imagery – graphics shall use 3D images for all standard and custom graphics. The only allowable exceptions will be photo images, maps, schematic drawings, and selected floor plans.
 - b. Animation. Graphics shall be able to animate by displaying different Image files for changed object status.
 - c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
7. Graphics Library. Furnish a library of standard HVAC equipment such as chillers, air handlers, terminals, fan coils, unit ventilators, rooftop units, and VAV boxes, in 3 - dimensional graphic depictions. The library shall be furnished in a file format compatible with the graphics generation package program.
8. Document Support. The Enterprise operator web interface shall support the ability to import support files into a support files library.
- a. Imported support files can include the following types of document formats: pdf, docx, xlsx, pptx, jpeg, tif, bmp, png, jpg, gif

- b. All imported support files can be associated directly with equipment or family types that can then be accessed directly from standard pages
- 9. Manual Control and Override.
 - a. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system.
 - b. Timed Overrides. The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.
 - c. Override Owners. The system shall convey to the user the Owner of each override for all priorities that an override exists.
 - d. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.
 - e. Global Point Control. Provide a method for a user to view, override, and edit if applicable, the status of multiple object and properties in the system. The point status shall be available by menu, on graphics or through custom programs.
 - f. Creating Override Search Queries. The system shall allow the operator to search for overrides across building(s), equipment, systems. User shall have the ability to view and release multiple overrides at once or one at a time.
- 10. Scheduling. A user shall be able to perform the following tasks utilizing the Enterprise operator web interface:
 - a. Create a new schedule, defining the default values, events and membership.
 - b. Create exceptions to a schedule for any given day.
 - c. Apply an exception that spans a single day or multiple days.
 - d. View a schedule by day, week and month.
 - e. Exception schedules and holidays shall be shown clearly on the calendar.
 - f. Modify the schedule events, members and exceptions.
 - g. Create schedules and exceptions for multiple buildings
 - h. Apply emergency schedule to multiple buildings
 - i. Drag and drop scheduling editing
 - j. Global schedule and exceptions across multiple buildings
- 11. Data Logs
 - a. The Enterprise operator web interface shall allow a user with the appropriate security permissions to define a Data Log for any data in the system.
 - b. The Enterprise operator web interface shall allow a user to define any Data Log options as described in the Application and Control Software section.
 - c. The operator shall be able to specify the duration of historical data to view by scrolling, zooming, or selecting from a pull-down list.
 - d. The system shall provide a graphical trace display of the associated time stamp and value for any selected point along the x-axis.
 - e. Operator will have the ability to show alarms and overrides on any data log view.

- f. The Enterprise operator web interface shall allow a user to Print or download Data Log views in multiple formats including raw data (CSV, XLS) or image (PNG, JPG, PDF, SVG).
12. Alarm/Event Notification
 - a. An operator shall be notified of new alarms/events as they occur while navigating through any part of the system via an alarm icon.
 - b. The operator will have the option of selecting an audible alarm notification for all alarm classes they subscribe to.
 - c. The system operator will have the option of setting specific times and days that they will receive alarm notifications.
 - d. Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any Enterprise operator web interface.
 - (1) The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 24 categories based on severity.
 - (2) Alarm/event messages shall use full language, easily recognized descriptors.
 - (3) An operator with the proper security level may acknowledge and clear alarms/events.
 - (4) All alarms/events that have not been cleared by the operator shall be stored by the building controller.
 - (5) The alarm/event log shall include a comment field for each alarm/event that allows a user to add specific comments associated with any alarm.
 - (6) All alarm logs will provide both grouping multiple filter options for sorting and locating specific alarm or groups of alarms.
 - (7) Alarm logs shall provide the ability to navigate directly to object with one click
 - e. Alarm Configuration.
 - (1) The operator shall be able to configure any object in the system to generate an alarm when transitioning in and out of a normal state.
 - (2) The operator shall be able to configure the alarm limits, warning limits, states, and reactions for each object in the system.
 - (3) The operator shall be able to set up conditional alarm limits based on reference points.
 - (4) The operator shall be able to create queries to see current alarm properties across building(s), equipment, systems for any available point.
 - (5) The operator shall be able to run saved queries to see current alarm settings and modify and change them in mass.
13. User Change Log. The operator shall be able to view all logged user changes in the system from any Enterprise operator web interface.
 - a. An operator shall be able to group user changes by: date, affected, date & affected, user, date & user, transaction type, date & transaction type, or sort only.

- b. The operator will have the option of additional filtering capability of: date, transaction, type, user, affected, and details that can be used individually or in conjunction with other filters.
- 14. Standard and Custom Reports
 - a. The Enterprise operator web interface shall provide a reporting package that allows the operator to select reports to run.
 - b. The Enterprise operator web interface shall provide the ability to schedule reports to run at specified intervals of time.
 - c. The Enterprise operator web interface shall provide the ability to email schedule reports at specified intervals of time.
 - d. The Enterprise operator web interface shall allow a user to create reports in either a pdf. or Excel format.
 - e. Reports and logs shall be readily printed to the system printer.
 - f. The Enterprise operator web interface shall provide the ability to create and modify both standard and custom reports.
 - g. The following standard reports shall be available without requiring a user to manually design the report:
 - (1) All Points in Alarm Report: Provide an on-demand report showing all current alarms.
 - (2) All Points in Override Report: Provide an on-demand report showing all overrides in effect.
 - (3) Site Commissioning Report: Provide a one-time report that lists all equipment with the unit configuration and present operation.
 - (4) Air Handler Status Report: Current status and short historical operation of selected air handlers
 - (5) Air System Status Report: Current status and short historical operation of selected VAS
 - (6) Area Status Report: Current status and short historical operation of selected Area
 - (7) Chiller Plant Status Report: Current status and short historical operation of selected chiller plant
 - (8) Chiller Status (ASHRAE) Report: Standard points defined by ASHRAE 147-2013 for tracking and operation of air conditioning equipment
 - (9) Schedules Report: List of all weekly events for all schedules in selected buildings
 - (10) Space Comfort Analysis Report: List of spaces that meet selected criteria for potential comfort issues (temp variance, high, low , unoccupied)
 - (11) Space List Report: Current status of multiple spaces in selected buildings
 - (12) Space Status Report: Current status and short historical operation of selected spaces
 - h. The following custom report functionality shall be available without requiring a third party reporting tool:
 - (1) Bar Chart: Create a bar chart for any data log or custom report equation in the system
 - (2) Line Chart: Create a line chart for any data log or custom report equation in the system

- (3) Scatter Plot: Create a scatter plot for any data log or custom report equation in the system
- (4) Histogram: Create a Histogram for any data log, point, or custom report equation in the system
- (5) Pie Chart: Create a Pie chart for any data log, point, or custom report equation in the system
- (6) Single Values: Display single values from any point, data log, or equation on a custom report
- (7) Values Table: Display a formatted table for point values from any family type (spaces, air handlers, chillers, areas, air systems, chiller plants, or programmable controllers)
- (8) Data Log Table: Create a formatted table from selected data logs
- (9) User Change Log Table: Create a formatted table of user changes with date/time, user, what was changed, new/old value for any family type (spaces, air handlers, chillers, areas, air systems, chiller plants, or programmable controllers)
- (10) Text Box: Create a text boxes that can be placed and sized on any custom report
- (11) Image: Download and place images that can be placed and sized on any custom report
- (12) Size and position of ability of all items on a custom report
- (13) Both standard and custom page size capabilities
- (14) Save, edit, delete, and save as capability
- (15) Equation capability on data logs or points that can be used in custom reports (+, -, *, /)

15. Dashboards

- a. The Enterprise operator web interface shall provide a dashboard package that allow s the operator to select dashboards to view, select as their home page or add to their navigation tree.
- b. Dashboards will be responsive to all screen size and work with any size monitors, tablets, or smart phones
- c. The Enterprise operator web interface shall provide the ability to create and modify dashboards without the use of any 3rd party tools.
- d. The following dashboard functionality shall be available without requiring a third-party reporting tool:
 - (1) Bar Chart: Create a bar chart for any data log/trend in the system
 - (2) Line Chart: Create a line chart for any data log/trend in the system
 - (3) Histogram: Create a Histogram for any data log/trend, point in the system
 - (4) Html Web Page: ability to display webpages directly in dashboard
 - (5) Status Values: Display single or multiple values from any point, data log, in the system
 - (6) Values Table: Display a formatted table for point values from any family type (spaces, air handlers, chillers, areas, air systems, chiller plants, or programmable controllers)

- (7) Text Box: Create a text boxes that can be placed and sized on any dashboard
- (8) Image: Download and place images that can be placed and sized on any dashboard
- (9) Alarm Status: ability to display select alarm sources (building(s), equipment, systems, categories, and status) on any dashboard
- (10) Circle and fill gates: Display single values from any point, data log, in the system in either a full circle, half circle, or horizontal fill gauge on any dashboard.
- (11) Size and position of ability of all items on a dashboard
- (12) Ability to select different dashboard themes and import custom themes that can be applied to any dashboard
- (13) Save, edit, delete, and save as capability
- 16. Remote Access / Network Security – The project's Controls Contractor/manufacturer shall provide secure remote access to the Building Automation System (BAS).
 - a. Secure remote access to the BAS shall not require additional software to be installed on the client device (i.e. VPN client).
 - b. Secure remote access to the BAS shall not require ANY inbound ports on a firewall to be "exposed" or "forwarded".
- 17. System Security
 - a. User Profiles shall restrict the user to only the objects, applications, and system functions as assigned by the system administrator.
 - b. The system shall include pre-defined "roles" that allow a system administrator to quickly assign permissions to a user.
 - c. User logon/logoff attempts shall be recorded.
 - d. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.
 - e. The system shall support Active Directory for user set-up and management
 - f. The system shall track and record all user log-in activity and all changes done at the enterprise level including who made the change, when, what was changed, pervious value and new value.
- 18. On-Line Help and Training
 - a. Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.
 - b. On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.

2.4 ADVANCED APPLICATION CONTROLLERS

- A. Advance Application Controllers shall be used to control all equipment or applications of medium and high complexity, including but not limited to Air Handlers, Boiler Plants and Chiller Plants.
- B. For Stand-Alone Operation of Advanced Application Controllers:
 - 1. Shall operate a schedule in a standalone application using a Real Time Clock with a 7-day power backup.

- a. The Controller shall have a built-in schedule (assessable with or without a display)
 - b. Support will be for at least 3 schedules with up to 10 events for each day of the week.
 - c. Each of the 3 schedules can be Analog, Binary or Multi-State
 - d. The controller shall support a minimum of 25 exceptions each with up to 10 events.
- C. For ease of troubleshooting, the Controller shall support BACnet data trend logging.
 - 1. With a minimum of 20,000 trending points total on a controller.
 - 2. Trends shall be capable of being collected at a minimum sample rate of once every second
 - 3. Shall be capable of trending all BACnet points used by controller
 - 4. Trends shall be capable of being scheduled or triggered.
- D. To meet the sequence of operation for each application, the Controller shall use library programs provided by the controller manufacturer that are either factory loaded or downloaded with service tool to the Controller.
- E. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
 - 1. Operating conditions:
 - a. Temperature: -40°F to 158°F (-40°C to 70°C)
 - b. Relative Humidity: 5% to 100% RH (non-condensing)
 - 2. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.
 - 3. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at - 40° F to 158° F [-40° C to 70° C].
- F. Input/Output: The Controller shall have on board or through expansion module all I/O capable of performing all functionality needed for the application. Controls provided by the equipment manufacture must supply the required I/O for the equipment. In addition, other controls must meet the following requirements:
 - 1. Shall support flexibility in valve type, the controllers shall be capable of supporting the following valve control types: 0-10VDC, 0-5VDC, 4-20mA, 24VAC - 2 position.
 - 2. Shall support flexibility in sensor type, the Controller shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, 50ms or longer pulses, 200 to 20Kohm and RTD input.
 - 3. Shall support flexibility in sensor type, all Analog Outputs shall have the additional capability of being programmed to operate as Universal Inputs or Pulse Width Modulation Outputs.
 - 4. Shall support flexibility in sensor type, the Controller and/or expansion modules shall support dry and wetted (24VAC) binary inputs.
 - 5. The controller shall support pulse accumulator for connecting devices like energy meters.
 - 6. In order to support a wide range of devices, the Controller's binary output shall be able to drive at least 10VA each.

7. For future needs, any unused I/O that is not needed for the functionality of the equipment shall be available to be used by custom programs on the Controller and by any other controller on the network.
 8. The Controller shall provide 24VAC and 24VDC power terminals sensors and other devices required.
 9. The Controller shall provide a dedicated static pressure input.
- G. Input/output Expandability – The Controller shall provide the following functionality in order to meet current and future application needs:
1. For the application flexibility, the Controller shall be capable of expanding to a total of at least 100 hardware I/O terminations.
 2. Expansion I/O can be mounted up to 650 ft. (200m) from control.
 3. For optimized system operation, expansion I/O must communicate via an internal controller communication bus (point expansion via the BACnet MS/TP network is not allowed).
- H. Serviceability – The Controller shall provide the following in order to improve serviceability of the Controller.
1. Diagnostic LEDs for power/normal operation/status, BACnet communications, sensor bus communications, and binary outputs. All wiring connections shall be clearly labeled and made to be field removable.
 2. Binary and analog inputs and outputs shall use removable connectors or be connected to terminal strip external to the control box.
 3. Software service tool connection through all of the following methods: direct cable connection to the Controller, connection through another controller on BACnet link and through the Controller's zone sensor.
 4. For safety purposes, the controller shall be capable of being powered by a portable computer's USB port for the purposes of configuration, programming and testing programs so that this work can be accomplished with the power off to the associated equipment.
 5. The Controller software tool service port shall utilize standard off-the-shelf USB printer cable.
 6. Capabilities to temporarily override the BACnet point values with built-in time expiration in the Controller.
 7. To aid in service replacement, the Controller shall easily attached to standard DIN rail mounting.
 8. For future expansion, the Controller shall be capable of adding sequence of operation programming utilizing service tools software with a graphical programming interface (editing or programming in line code is not permissible).
 9. To aid in service replacement, the Controller shall allow for setting its BACnet address via controller mounted rotary switches that correspond to the numerical value of the address. (DIP switch methodologies are not allowed). Setting of the address shall be accomplished without the need of a service tool or power applied to the controller.
 10. Controller data shall be maintained through a power failure.
- I. Software Retention: All Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.

- J. Controller must meet the following Agency Compliance:
 - 1. UL916 PAZX, Open Energy Management Equipment
 - 2. UL94-5V, Flammability
 - 3. FCC Part 15, Subpart B, Class B Limit
 - 4. BACnet Testing Laboratory (BTL) Listed

2.5 APPLICATION-SPECIFIC CONTROLLERS

- A. Application Specific Controllers (ASC) shall be microprocessor -based DDC controllers which, through hardware or firmware design, control specified equipment. They are not user programmable, but are customized for operation within the confines of the equipment they are designed to serve.
- B. Zone Controllers are controllers that operate equipment that control the space temperature of single zone. Examples are controllers for VAV, Fan coil, Blower Coils, Unit Ventilators, Heat Pumps, and Water Source Heat Pumps.
- C. Software
 - 1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.
 - 2. Stand-Alone Operation: Each piece of equipment specified in section "A" shall be controlled by a single controller and provide stand-alone control in the event of communication failure. In case of communications failure stand-alone operation shall use default values or last values for remote sensors read over the network such as outdoor air temperature.
 - 3. For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.
- D. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.
 - 1. Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.
 - 2. Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.
 - 3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.
 - 4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].
- E. Input/Output:
 - 1. For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following valve control types 0-10VDC, 0-5VDC, 4-20mA, 24VAC floating point, 24VAC - 2 position (Normally Open or Normally Closed).
 - 2. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, pulse counts, and 200 to 20Kohm.

3. For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.
4. For flexibility in selection and replacement devices, the controllers shall have binary output which are able to drive at least 12VA each.
5. For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).
6. For future needs, any I/O that is unused by functionality of equipment control shall be available to be used by custom program on the controller and by another controller on the network.
7. For future expansion and flexibility, the controller shall have either on board or through expansion, 20 hardware input/output points. Expansion points must communicate with the controller via an internal communications bus. Expansion points must be capable of being mounted up to 650ft. (200 m) from the controller. Expansion points that require the BACnet network for communication with the controller are not allowed.

F. Serviceability – The controller shall provide the following in or der to improve serviceability of the controller.

1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.
2. All binary output shall have LED's indicating the output state.
3. All wiring connectors shall removable without the use of a tool.
4. Software service tool connection through all of the following methods: direct cable connection to the controller, connection through another controller on BACnet link and through the controller's zone sensor.
5. For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.
6. Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.
7. BACnet MAC Address shall be set using decimal (0-9) based rotary switches.
8. Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.
9. For ease of troubleshooting, the Controller shall support BACnet data trend logging.
 - a. With a minimum of 20,000 trending points total on controller
 - b. Trends shall be capable of being collected at a minimum sample rate of once every second.
 - c. Shall be capable of trending all BACnet points used by controller
 - d. Trends shall be capable of being scheduled or triggered

G. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.

H. Agency Approval: The controller shall meet the Agency Compliance:

1. UL916 PAZX, Open Energy Management Equipment
2. UL94-5V, Flammability
3. FCC Part 15, Subpart B, Class B Limit

2.6 SYSTEM COMPONENTS:

- A. Temperature Sensors: Shall match existing City of Clovis Standard. Temperature sensors shall be Thermistor, 10K @ 77F, Type 2.
- B. Wall Switches: Plates for all wall switches and timers shall match those specified in Division 16.
- C. Labels: All labels, signs, etc. shall be engraved, laminated plastic, white on black background, 1/8" high lettering, minimum.
- D. Temperature Control Panels: Hinged, lockable front panel. Each panel and each control device or readout on the front of the panel shall be identified with an engraved plastic label with 1/4" high lettering, white on black background. Pilot lights shall be the push-to-test type.
- E. Status Sensor: Current sensing status sensor, with sensitivity adjustment for belt driven equipment.
- F. Smoke Detectors: Smoke detector shall be ionization type, 115 VAC. The detector shall operate at air velocities from 300 FPM to 4000 FPM. The detector head shall not require additional filters or screens. The detector shall be mounted in a sheet metal housing with removable cover. A visual indication of alarm and pilot must be provided on detector front mounted at 30 degrees angle for a wide viewing angle. Manual test and reset switch on the front of the detector. Terminal connections shall be of the screw type. Power supervisory relay. Minimum of two sets of alarm contacts (one reserved for fire alarm system). UL listed. California State Fire Marshal listing #3240-1004:105. Air Products and Controls, Ltd. SL-2000 Series.
- G. Occupancy Sensor: Provide occupancy sensors where indicated on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. The Contract Documents shall be thoroughly examined for coordination of control devices, their installation, wiring, and commissioning. Coordinate and review mechanical equipment specifications, locations, and identify any discrepancies, conflicts, or omissions that shall be reported to the Architect/Engineer for resolution before rough-in work is started.
- B. The BAS manufacturer shall inspect the jobsite in order to verify that control equipment can be installed as required, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.2 PROTECTION

- A. The BAS installation contractor shall protect all work and material from damage by their work or personnel, and shall be liable for all damage thus caused.
- B. The BAS manufacturer shall be responsible for their work and equipment until final inspection, testing, and acceptance. The BAS installing contractor shall protect their work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to

3.3 COORDINATION

- A. Site
 - 1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
 - 2. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.
- B. Submittals. Refer to the "Submittals," section of this specification for requirements.
- C. Test and Balance
 - 1. The controls contractor shall provide a qualified technician to assist in the test and balance process.

3.4 GENERAL WORKMANSHIP

- A. Install equipment, piping, wiring/conduit, parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible locations as defined by National Electric Code (NEC). Control panels shall be attached to structural walls or properly supported in a free- standing configuration, unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.
- D. Verify integrity of all control wiring to ensure continuity and freedom from shorts and grounds prior to commencing the startup and commissioning procedures.
- E. All control device installation and wiring shall comply with Contract Documents, acceptable industry specifications, and industry standards for performance, reliability, and compatibility. Installation and wiring shall be executed in strict adherence to local codes and standard practices referenced in Contract Documents.

3.5 FIELD QUALITY CONTROL

- A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Contract Documents.
- B. BAS manufacturer shall continually monitor the field installation for building code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.
- C. BAS installing Contractor(s) shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.6 CLEANING

- A. Provide the BAS manufacturer's installing contractor(s) shall clean up all debris resulting from their installation activities on a daily basis. The installation contractors shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Owner, Construction Manager, General Contractor, and/or Mechanical Contractor.
- B. At the completion of work in any area, the installation contractor shall clean all of their work, equipment, etc., making it free from dust, dirt and debris.
- C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage. Any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.7 INSTALLATION:

- A. All electrical work shall be in accordance with the California Electrical Code and Electrical Specification Sections. All electric/electronic systems shall be hardwired in conduit. 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. Set, test and adjust the system for proper operation.

3.8 SEQUENCE OF OPERATION

- A. System Shall Function as Follows:
 - 1. General: Connect to existing DDC/EMS at City of Clovis.
 - 2. Heating/Cooling Units: (Heating setpoint 72°F, Cooling setpoint 75°F) The unit shall run per the system operation schedule through the DDC/EMS.

Room temperature sensor shall be wall mounted. If the bypass button on the room temperature sensor is activated, the heating/cooling unit shall start for two hours (adj.). The unit setpoint shall be adjustable $\pm 2^{\circ}\text{F}$ (adj.) from a switch located on the temperature sensor. Unit fan shall run continuously on start by the DDC/EMS. DDC/EMS shall control the heating/cooling unit to maintain setpoints. On call for cooling, the DDC/EMS shall start the unit cooling at 2°F (adj.) above cooling setpoint and run to 2°F (adj.) below cooling setpoint and then stop the unit cooling. On call for heating, the DDC/EMS shall start the unit heating at 2°F (adj.) below heating setpoint and run to 2°F (adj.) above heating setpoint and then stop the unit heating. The unit shall be capable of economizer operation. The DDC/EMS shall monitor the unit fan status with a current sensor and the supply air temperature. Units as shown on drawings shall have a smoke detector in the supply duct which shall shut off the unit on alarm and signal the fire alarm system (Div. 28). DDC/EMS shall monitor economizer status through the unit's factory BACnet interface card. Provide occupancy sensor(s). When occupied, fan shall run continuously. When all sensors are in unoccupied mode, fan shall switch to auto and economizer shall go to minimum outside air setting.

3. Heating/Cooling Units with VVH Boxes:

- a. General: The unit shall run per the system operation schedule through the DDC/EMS. The DDC/EMS shall interface with the unit controller to monitor system status/control points. Unit fans shall run continuously on start by the DDC/EMS. The unit controller shall control the VVH system operation and outside air reset. The unit shall be capable of an economizer cycle. A static pressure sensor within the unit shall modulate the VFD at the supply fan to maintain a constant supply duct pressure. The system shall operate either in the Heating Mode or the Cooling Mode. In the Heating Mode, all VVH boxes on the system shall be reverse acting and use the heating temperature setpoint. In the Cooling Mode, all VVH boxes on the system shall be direct acting and use the cooling temperature setpoint. A smoke detector in the supply duct shall shut off the unit on alarm and signal the fire alarm system (Div. 28). A factory furnished static pressure sensor shall be installed in the ceiling to control the power exhauster to maintain a $0.05''$ W.C. (adj.) setpoint when unit is in economizer operation. Provide a co-axial cable switch plate cover for mounting the room pressure sensing port.
- b. Heating Mode: On system startup, if the temperature sensors for all VVH boxes call for heating, the furnace shall activate. When the temperature sensors for all VVH boxes reach setpoint, the furnace shall deactivate.
- c. Cooling Mode: (Initial leaving air temperature setpoint 55°F) The refrigeration system shall maintain a 55°F leaving air temperature. If the outside air temperature is less than 55°F (adj.), the economizer shall function and the refrigeration system shall be off.
- e. DDC/EMS Monitoring Points: The DDC/EMS shall monitor the following points:

- Unit fan status (current sensor at each fan, alarms on no power or belt loss)
- Supply air temperature
- Supply air duct pressure
- Room air temperatures (through the VVH boxes temperature sensors)
- Outside air damper relative position (Min. to Max. in percent of opening)
- f. Alarms: If the unit shuts off from the smoke detector, the DDC/EMS shall indicate a unit smoke detection alarm.
If the unit is to be on and the current sensor indicates the unit fan is not running, the DDC/EMS shall indicate a unit fan failure alarm. The current sensor shall differentiate between a motor failure and a belt failure and indicate the type of failure.
If the power exhaust is to be on and the current sensor indicates the power exhaust fan is not running, the DDC/EMS shall indicate a power exhaust fan failure alarm. The current sensor shall differentiate between a motor failure and a belt failure and indicate the type of failure.
If the unit is to be cooling and the room air temperature sensor indicates a greater than 5°F (adj.) above room setpoint for 5 minutes (adj.) after call for cooling, the DDC/EMS shall indicate a unit cooling system failure alarm.
If the unit is to be heating and the room air temperature sensor indicates greater than 5°F (adj.) below room setpoint for 5 minutes (adj.) after call for heating, the DDC/EMS shall indicate a unit heating system failure alarm.
- g. Off Mode: The outside air damper goes to the closed position, the fans shut off, the refrigeration system and furnace shuts off.
- 3. Variable Air Volume Box with Reheat (VVH): (Heating setpoint 72°F, Cooling setpoint 75°F) A factory furnished wall mounted temperature sensor shall control each pressure independent VVH box through the HC-1 controls. When the room temperature is above cooling setpoint, the box shall operate in Cooling Mode. When the room temperature is below heating setpoint, the box shall operate in Heating Mode.
 - a. Cooling Mode: The box damper shall modulate to maintain cooling setpoint. If the box damper is in minimum position and the room temperature drops to 3°F (adj.) below setpoint and the supply air temperature is less than 65°F (adj.), the box shall go to Intermittent Cooling Mode.
In Intermittent Cooling Mode, the box damper shall close until the room temperature rises to 3°F (adj.) above setpoint at which time the box damper shall open to minimum position.
Zones requiring heat during cooling mode shall modulate hot water valve and supply air damper to maintain room setpoint.
 - b. Heating Mode: The DDC/EMS shall switch to reverse acting control of the box. The box damper shall modulate to maintain heating setpoint. If the box damper is in minimum position and the room temperature rises to 3°F (adj.) above setpoint, the box shall go to Intermittent Heating Mode.

- In Intermittent Heating Mode, the box damper shall close until the room temperature drops to 3°F (adj.) below setpoint at which time the box damper shall open to minimum position.
- c. DDC/EMS Monitoring Points: The DDC/EMS shall monitor the following points through the DDC/EMS interface:
 - Room temperature
 - Box airflow
 - Supply air temperature
 - d. Alarm: If the DDC/EMS sends a signal to the change the box airflow and the airflow does not change, the DDC/EMS shall signal a VVH box failure.
 - If the room temperature rises above setpoint in Cooling Mode, or drops below setpoint in Heating Mode; the DDC/EMS shall signal a VVH box room temperature failure.
 - On all VVH box failures, the DDC/EMS shall identify the box experiencing the alarm.
4. Ventilation Control: Spaces showing ceiling mounted EMS occupancy sensor(s) shall be controlled as follows: When spaces are not sensing occupancy via any room occupancy sensor serving that VVH zone, the VVH terminal or H/C unit shall close down or shut off until occupancy of the zone is resumed. When occupancy sensor is activated, the room sensor shall control VVH damper or HC unit as setpoint is reached.
 5. IDU/ODU: (Cooling setpoint 75°F) The system shall operate continuously. A factory furnished controller to be mounted on the wall shall control system operation. The control contractor shall provide the interlock wiring between the controller and the indoor unit, and the interlock wiring between the indoor and outdoor unit. Power wiring between the outdoor unit and indoor unit shall be by others. A wall mounted temperature sensor, without bypass button or adjustable setpoint switch, next to the controller shall monitor room temperature and shall alarm DDC/EMS if room temperature rises above 85°F (adj.). DDC/EMS shall monitor system status with current sensors (one each for ODU and IDU).
 6. Exhaust Fan: Shall start/stop by DDC/EMS. The DDC/EMS shall monitor the unit fan status with a current sensor. Fan ECM motor speed shall be controlled by DDC/EMS to maintain room static pressure setpoint. See equipment schedule on drawings.
 7. Domestic Hot Circulating Pump: Shall start/stop by DDC/EMS. The DDC/EMS shall monitor the pump status with a current sensor.
 8. Boiler and Pumps: Boiler setpoint shall be 140°F. Lead boiler and lead main pump shall start during hours of operation. Lag boiler and main pump are backup. Boiler and main pump shall lead / lag weekly. Building pumps shall start during their respective Building's operating schedule. Pumps shall run 5 minutes after boiler shutdown. Boilers shall have automatic isolation valves to prevent water circulation thru non-operating boiler.
 9. Minimum Outside Air Reset: A wall mounted CO2 sensor shall control the unit outside air damper through the unit control system when the system is in the Heating or Cooling modes to reset the minimum outside airflow. The CO2 sensor setpoints and the outside air damper setpoints shall be developed in coordination with the Balance Contractor.
 - a. CO2 Sensor Setpoints: The Control Contractor shall determine the base ambient CO2 concentration level after the unit system has been

balanced and the building is unoccupied. The upper and lower CO2 concentration setpoints shall be developed as follows:

The lower CO2 concentration setpoint shall be 200 ppm (adj.) above the base ambient CO2 concentration level.

The upper CO2 concentration setpoint shall be 600 ppm (adj.) above the base ambient CO2 concentration level.

- b. Outside Air Damper Minimum Airflow Setpoints: The Control Contractor shall set the outside air damper position airflow setpoints for the upper and lower CO2 concentration setpoints as follows:

	Lower CO2 Concentration OSA Damper Position <u>Airflow Setpoint</u>	Upper CO2 Concentration OSA Damper Position <u>Airflow Setpoint</u>
<u>HC Unit</u>	<u>As Scheduled</u>	<u>As Scheduled</u>
On Drawings	On Drawings	On Drawings

- c. Outside Air Damper Control: The unit controller shall adjust the OSA damper based on the input signal from the DDC/EMS.

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

All work under Divisions 26, 27, and 28 is subject to the General, Supplementary, Special Conditions and other Division 1 Specification Sections preceding this section. The Contractor will be responsible for and governed by all requirements. Drawings indicate the general arrangement of the electrical layout and work included. The Contractor will follow these drawings to lay out and check the drawings of other trades to verify locations and spaces in which work will be installed.

1.02 SUMMARY OF WORK

- A. This portion of the work includes furnishing of all labor and materials necessary for a complete wiring system to outlets and all equipment shown on the Drawings or covered by this section of the Specifications. In general, the work includes the following:
1. Utility services and facilities as detailed on the plans.
 2. Power service and distribution system as shown, complete with switchboards, panelboards, and feeders..
 3. Complete system of branch circuit wiring and equipment including all wiring devices and plates on all outlets.
 4. A new lighting fixture system complete with lighting controls, as shown on Plans, including T24 certified commissioning and acceptance testing.
 5. Fire alarm system, design, and permitted.
 6. Raceways, wiring, fused disconnect switches, etc., for equipment covered by other sections of these Specifications.
 7. All hangers, anchors, sleeves, chases and supports for fixtures, electrical equipment and materials including earthquake bracing.
 8. All excavating, backfill, concrete pads and bases as required for electrical work.
 9. Include payment of all required insurances, fees and taxes unless specifically shown "BY OTHERS".
- B. The electrical drawings are diagrammatic and do not necessarily show all raceway, wiring, number or types of fittings, offsets, bends or exact locations of items required by the electrical systems. Items not shown or indicated which are clearly

necessary for proper operation, payment or installation of systems shown shall be provided at no-increase in contract price.

- C. The exact routing of systems and location of devices and equipment shall be governed by coordination with other trades, structural and architectural conditions. Contractor shall verify requirements prior to roughing in.
- D. Install electrical work in cooperation with other trades and make proper provisions to avoid interferences and coordinate with structural and architectural features, in a manner approved by the Architect or Electrical Engineer. All changes caused by neglect to make such provisions shall be at Contractor's expense. Provide offsets and special fittings, as required to facilitate installation of the work.
- E. When a particular product or type of product is specified with a manufacturer's designation, the latest published specifications, installation, and construction information of the manufacturer shall constitute the minimum acceptable standard. Any substitutions shall be made in accordance with the SUBSTITUTIONS sections of the Specifications.

1.04 RULES AND REGULATIONS

- A. All work and materials shall be in full accordance with the latest rules and regulations of the following:
 - 1. California Electrical Code (CEC), 2016 Edition
 - 2. California Energy Commission, Title 24, 2016 Standards
 - 3. California Fire Code, 2016 Editions
 - 4. National Fire Alarm and Signaling Code NFPA 72, 2016 Edition
 - 5. California Building, Mechanical and Plumbing Codes, 2016 Editions
 - 6. California Code of Regulations
 - a. Title 8, Safety Orders
 - b. Title 19, Fire and Panic Safety Standard
 - c. Title 24, Part 1, Administrative Regulations
 - 7. Occupational Health and Safety Act (OSHA)
 - 8. California State Fire Marshal Rules
- B. Where two or more codes conflict, the most restrictive shall apply.
- C. Nothing in these Plans and Specifications is to be construed to permit work not conforming to these codes.

- D. Before the Final Certificate of Payment will be issued, the Contractor shall deliver to the Owner all Certificates, Permits, Record Drawings and Instructions/Parts Manuals.

1.05 TESTS AND STANDARDS

- A. The tests, standards, or recommended procedures of the following agencies shall relate to all parts of these Specifications and shall be considered a minimum:
 - 1. American National Standards Institute (ANSI).
 - 2. Underwriters Laboratories, Inc. (UL).
 - 3. National Electric Manufacturers Association (NEMA).
 - 4. Electrical Testing Laboratories (ETL).
 - 5. National Fire Protection Association (NFPA).
 - 6. Insulated Power Cable Engineers Association (IPCEA).
 - 7. Institute of Electrical and Electronic Engineers (IEEE).
 - 8. Illumination Engineering Society (IES).

1.06 EXAMINATION OF DOCUMENTS AND SITE

- A. Before submitting a proposal, each bidder shall carefully examine the electrical, mechanical, architectural, and structural drawings and specifications. He shall also visit the site and fully inform himself as to all existing conditions and limitations applying to the work. If, after such examination and study, it appears that any change from the drawings and specifications should be allowed, the bidder shall so state in writing together with any change in cost involved.
- B. By the act of submitting a proposal, each bidder shall be deemed to have made such examinations of the drawings and specifications and premises, and it will be assumed that he is therefore familiar with the entire scope of the project and has based his proposal upon the work described in the Drawings and Specifications and upon all existing conditions and limitations applying to his work.

1.07 IMPLEMENTATION

- A. Workmanship: The work shall be performed by competent workmen, skilled in the particular phase of the work entailed. The work shall be first class throughout, neat, accurate and in full accordance with the intent of these Specifications and the satisfaction of the Architect or Electrical Engineer.
- B. Safety: All standard safety procedures as set forth by OSHA, CCR, and California Division of Industrial Safety shall be strictly adhered to.

- C. Coordination: The Contractor shall familiarize himself with the work of other crafts so as to be able to provide electrical service of correct size and voltage and other requirements to any equipment to be installed.
- D. Scheduling: The installations shall be coordinated as to location and time, and interference causing delays and non-acceptable construction shall be avoided. Order equipment in a timely manner to prevent any delays in the construction schedule and he shall bear any penalty by vendors to meet schedules.
- E. Collaboration: Prior to commencing construction the Electrical Contractor shall arrange a conference with the general and sub-contractors as well as equipment suppliers and shall verify types, sizes, locations, requirements, controls, and diagrams of all equipment furnished by them.
- F. Materials: All equipment and materials shall be new, UL (Underwriters Laboratories) approved, and of the best quality. When specific trade names are used in connection with materials they are mentioned as standards but, this implies no right upon the part of the Contractor to substitute other materials or methods without prior approval.
- G. Excavation: The Contractor shall provide all excavating and backfill required for the proper installation of electrical work, whether or not shown on the Drawings or as specified. This shall be done per the EXCAVATION portion of the Specifications.
- H. Cutting and Repairing: The Electrical Contractor shall do all cutting necessary for the proper installation of his work, repair any damage done by himself or his workmen, and coordinate his work with that of others. Do no cutting or patching without approval of the Architect or Electrical Engineer. Round holes through concrete slabs or walls shall be core drilled with a diamond drill, rectangular openings shall be cut with a diamond saw. In no case shall any concrete beam or column be cut.
- I. Sleeves and Openings: Electrical Contractor shall be responsible for all sleeves and openings through walls and floors required by electrical work. All openings around conduits in sleeves shall be sealed with a material of equal fire rating as the surface penetrated. Openings not utilized shall be temporarily sealed in a similar manner. All required sleeves shall be furnished to and coordinated with the General Contractor.
- J. Cleaning and Painting: All exposed work shall be thoroughly cleaned upon completion of work. Panelboard enclosures, fixtures, and equipment, where finish has been marred in shipment or installation, shall be completely refinished. Minor finish damage shall be rectified as indicated by the Architect or Electrical Engineer. Contractor shall remove all waste and rubbish resulting from his work from the site.
- K. Earthquake Restraint: All electrical equipment shall have a means to prohibit excessive motion during an earthquake. Equipment that vibrates during normal operation shall have isolators with mechanical stops. All transformers are considered to vibrate during operation. All electrical equipment and connections shall be designed to resist lateral seismic forces equal to value shown on Drawings

of equipment weight with allowable working code capacity increased by 1/3 or 1.5 times the same value for the weight yield capacity. Connections shall be the same except the 1/3 increase will not be allowed.

L. Mechanical Equipment and Other Special Equipment:

1. Prior to commencing construction, the Contractor shall arrange a conference with the Mechanical and Plumbing Contractors, and the Equipment Suppliers, to verify type, sizes, locations, requirements, controls and diagrams of all equipment furnished by them
2. The Contractor shall furnish all electrical line voltage wiring, fused disconnects and conduits, unless otherwise shown.
3. The Contractor shall be responsible for electrical hook-up and connection to all electrical equipment furnished by all Contractors of this Project. This includes all mechanical equipment, plumbing equipment, and special equipment furnished by other contractors as shown.

M. Portable and Detachable Parts: The Contractor shall retain in his possession and shall be responsible for all portable and detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until final completion of his work. These parts shall be itemized and delivered to the Owner at Project Closeout.

1.08 QUALITY CONTROL

- A. Supervision: The Contractor shall personally, or through a competent representative, constantly supervise the work from beginning to completion and final acceptance. He shall cooperate fully with the inspection authorities in the provision of information and access to the work. He shall, to the best of his ability, maintain the same job foreman throughout the life of the project unless a replacement is requested or authorized by the Architect or Electrical Engineer.
- B. Inspection and Tests: The Contractor shall furnish all labor and test equipment required to fully test and adjust the equipment installed under this specification and demonstrate its proper operation.
1. Arrange for all tests and inspections and provide minimum 48 hours' notice to the Architect or Electrical Engineer.
 2. A test must demonstrate that each piece of equipment, outlet, fixture, device, and appurtenance is in sound operating condition and in proper cooperative relation to associated equipment.
 3. All tests shall be conducted under supervision of the Architect or Electrical Engineer, and any defects of any nature which are apparent as a result of such test shall be made correct to the satisfaction of the Architect or Electrical Engineer before final acceptance is made.

4. No equipment shall be tested, or operated for any other purpose, such as checking motor rotation, until it has been fully checked in accordance with the manufacturer's instructions.
- C. Warranty: The Contractor agrees to replace or repair, to the satisfaction of the Owner, any part of the installation which may fail due to defective material and/or workmanship or failure to follow Drawings and Specifications, for a period of one year after final acceptance. Any damage to other work resulting from such failure or the correction thereof shall be remedied at the Contractor's expense. The Contractor shall, further, secure from the manufacturers of special equipment, such as signal systems, their respective guarantees and deliver same to Owner. Guarantees between Contractor and his suppliers shall not affect warranties between Contractor and Owner.

1.09 SUBMITTAL

- A. Make submittal for all material to be used on the project, whether as specified or substitutions, within thirty five (35) days after award of Contract by the Owner, in accordance with Section 01-300, SUBMITTAL, and the following:
1. All submittal shall be neat and bound in a suitable folder or binder.
 2. Identify each item by manufacturer, brand, trade, name, number, size, rating, and whatever other data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.
 3. Identify each submittal item by reference to specifications.
 4. All submittal shall be submitted in coherent groups, e.g. all light fixtures at one time. No partial, or incomplete submittal will be accepted.
 5. Organize submittal in same sequence as they appear in specification sections, articles or paragraphs.
- B. Product Data: Submit PDF copies, in groups, as follows:
1. Boxes, pullboxes, conduits, and raceway types required, including fittings
 2. Electric Wire, cable and connectors
 3. Switchboards, Panelboards, Transformers, and disconnects.
 4. Lighting fixtures and controls
 5. Wiring Devices
 6. Data and VoIP systems
 7. Fire alarm system

8. Emergency power system

- C. Shop Drawings: Shop drawings shall show physical arrangement, wiring diagram, construction details, finishes, materials used in fabrication, provisions for conduit entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, weight, power sources, circuit numbers, and shall be compatible with the Contract Drawings and Specifications.
- D. Show wiring as actually installed, connected, and identified for this specific project. Include identification of cables and cable conductors.
- E. Shop and instruction drawings shall cover the equipment or device to be installed and not merely the general class of such equipment or device.

1.10 SUBSTITUTIONS

- A. The Specifications or Drawings are in no way to be construed as being proprietary toward one product. Those products, or types of products, listed are intended to set the standard for quality, design, and installation procedure. However, no right is implied upon the part of the Contractor to substitute other materials, products or systems without the written approval of the Architect or Engineer.
- B. All proposed substitutions shall be standard product of the firm under current manufacture and be a catalog item at time of bid.
- C. Acceptance of substitution shall not relieve the Contractor from responsibility for complying with requirements of the Contract Documents. The Contractor shall be responsible for changes in other parts of the work occasioned by his substitutions and shall bear their expense.
- D. Representative samples may be required for determination of equality. It is understood that the samples may be subjected to destructive testing and will not be returned.

1.12 GUARANTEE

This Contractor agrees to replace or repair to the satisfaction of the Owner, any part of the installation that may fail due to defective material and/or workmanship, or failure to follow Plans and Specifications for one year after final acceptance. He shall further obtain from the manufacturers of special equipment (i.e., control systems) their respective guarantees and service manuals and deliver to Owner.

1.13 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

The Engineer's decision will be final on interpretation of the Drawings and Specifications. Whenever "AS MAY BE DIRECTED", "SUITABLE", "APPROVED EQUAL", "AS REQUIRED", or other words of similar intent and meaning are used which infer that judgment is to be exercised, it is understood that it is the judgment of the Engineer being referred to.

PART 2 – PRODUCTS

2.01 RACEWAYS:

- A. Except where specifically shown otherwise in this section, the Contractor shall furnish and install a complete conduit system for all wiring.
- B. Galvanized Rigid Steel (GRS)
 - 1. Joints are to be sealed with conductive pipe compound T&B "Kopr-Shield" before making up.
 - 2. Conduits installed below grade shall be wrapped with 3M "Scotchrap #51" corrosion protection tape using half-laps for double thickness. Conduit surfaces are to be clean and dry before wrapping.
- C. Steel Electrical Metal Tubing (EMT)
 - 1. EMT may be used within the hollow dry spaces of buildings. Trade sizes 4" and smaller may be used within hollow dry spaces of the building.
 - 2. EMT conduit shall be Allied True Color E-Z Pull, or equal.
 - 3. All raceway fittings, locknuts, couplings, elbows, etc. Cast-type fittings shall not be used.
- D. Non-Metallic Polyvinylchloride Conduit (PVC):
 - 1. Rigid nonmetallic PVC, UL labeled and fittings approved for the purpose may be used for electrical systems 0-600V-to-ground under the following conditions:
 - a. All conduits in earth under buildings or protected by permanent paving may be Schedule 40 PVC. All raceways above grade are to be steel.
 - 2. All nonmetallic runs shall have a bond wire for the interconnecting of all conducting portions per Article 250 of the California Electric Code.
 - 3. PVC shall never be used above grade.
- E. Liquid-Tight Flexible Metal Conduit (LFMC):

LMFC may be used in lengths not greater than 36" at motors and other machinery to prevent the transmission of vibration. LFMC shall be supported at both ends.
- F. Surface raceways and fastenings are to be two-piece steel type, complete with all fittings of the same manufacturer and factory finished in gray. Surface plug-in strips shall be two circuit type with NEMA grounded receptacles every 12" with wiring space provided.

- G. The minimum size conduit for lighting, power, and signal wiring shall be 3/4" trade size.
- H. MC Cable for branch circuits with EMT Home Runs.

2.02 CONDUCTORS:

- A. All conductors shall arrive to the project in their original, unbroken packages plainly marked as follows:
 - 1. Packaging shall indicated underwriter's labels, size, conductor material, insulation of wire, names of the manufacturer and the trade name of the wire.
 - 2. Wire or cable shall have factory markings every 24". Markings shall show its maximum allowable voltage, wire size and insulation.
- B. All conductors shall be a minimum of 98% conductivity, soft drawn copper, minimum #12 AWG unless shown otherwise. Conductors sized #8 and larger shall be stranded. Insulation shall be 600 Volt, type "THWN or THHN."
- C. Control circuits for mechanical equipment in locations subject to abnormal temperatures on or under furnaces and heaters shall be Type "RHH" 600 Volt insulation conductors.
- D. Two-bolt type solderless connectors or T&B "ColorKeyed" compression lugs shall be used on #8 and larger conductors.
- E. Soft drawn compact Aluminum feeder conductors may be used for phase conductors sizes # 1/0 and above and grounding conductors # 6 and above. Provide compression lugs with oxidation inhibitor for all aluminum termination.

2.03 WIRING DEVICES:

- A. Furnish and install wiring devices and plates as shown on the Drawings and described in these Specifications. Where more than one wiring device is mounted in the same location, such devices shall be mounted in a multi-gang plate. Wiring devices shall be specification grade or better.
- B. Wiring devices shall be of the color selected by the Architect.
- C. Convenience outlets to consist of a specification grade duplex receptacle mounted in an outlet box in the wall, flush with the finished plaster or surface. Outlet rating to be 20 AMPS, 125 Volts, 3-wire, back and side wired.
- D. All outlets shown outdoors or in damp locations shall be GFI type, installed in a weatherproof box and cover equipped with rubber gaskets. Surface outlets shall be weatherproof type FS boxes with hubs as required and equipped with rubber gaskets and weatherproof covers.

- E. Local switches shall be quiet toggle type, totally enclosed, 20 AMPS, 277 Volts AC rated.
- F. Device plates shall be provided for all devices with the number of gangs and openings necessary.

2.04 OUTLET BOXES:

- A. Outlet boxes for concealed work shall be one piece pressed steel knock-out type with zinc or cadmium coating. Boxes shall not be smaller than 4" square nominal size unless otherwise indicated. Provide extension rings, extenders, plaster rings and covers necessary for flush finish. No back-to-back or through-boxes shall be used.
- B. 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. Use expansion shields in concrete and masonry. Where used for lighting fixtures, outlet boxes shall be equipped with fixture studs.
- C. Provide approved knock-out seals on all unused open knock-out holes.
- D. Outlet boxes installed in concrete slabs shall be two-piece concrete boxes, not less than 4" nominal size with a minimum depth of 2 ½".
- E. Surface boxes of cast metal threaded hub-type with suitable gasketed covers shall be used for exposed conduit runs less than 5' above finished floor, or where waterproof boxes are required.

2.05 PULL BOXES AND WIREWAYS:

- A. Pull and junction boxes shall be installed as shown to ease the pulling of wire and to comply with CEC requirements.
- B. 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.

2.06 TERMINAL CABINETS AND CLOSETS:

- A. Cabinets and fronts shall be in accordance with NEMA Standard Publication No. PB 1-1971 and UL Standard 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 panelboard locks. Fronts are to be adjustable indicating trim clamps that shall be completely concealed when the doors are closed.
- B. 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 finish steel with rust inhibiting primer and baked enamel finish.

- C. Install finish grade 3/4" plywood board at the interior rear surface of telephone and signal cabinets.
- D. Provide solderless box lugs, terminal blocks with a white marking strip for conductors sized #16 and larger. Punch-down terminals shall be used for No. 18 and smaller and shall be used for all public address, intercom and other electrical terminations.

2.07 FLOOR BOXES AND UNDERFLOOR DUCTS:

- A. Provide fully adjustable Type 1, Class 1 watertight floor boxes complete with wiring devices and where shown on Plans.
- B. Fittings for floor box cover finish shall be as selected by Architect.
- C. Verify floor finish prior to purchase. Provide carpet flanges of proper size in carpeted or tiled areas.

2.08 NOISE CONTROL:

- A. Outlet boxes at opposite sides of partitions shall not be placed back-to-back or through-boxes employed except where specifically permitted on the Drawings by note to reduce transmission of noise between occupied spaces.
- B. Contactors, starters, and similar noise-producing devices shall not be placed on walls that are common to occupied spaces unless specifically called for on the Drawings. Where such devices must be mounted on walls common to occupied spaces, they shall be shock mounted or isolated in such a manner to effectively prevent the transmission of their inherent noise to the occupied space.
- C. Contactors, starters, drivers, and like equipment found noticeably noisier than other similar equipment on the project will be deemed defective and shall be replaced at Engineer's request.

PART 3 – EXECUTION

3.01 INSTALLATION - GENERAL:

- A. The layout and installation of electrical work shall be coordinated with the overall construction schedule to prevent delay in completion of the project. Checking these Drawings before organizing the electrical work schedule or installing material and equipment shall be obligatory.
- B. Dimensions and information regarding accurate locations of equipment and structural limitations and finish shall be verified with other sections.
- C. The Drawings do not show all the offsets, bends, special fittings, junction boxes, or pull boxes necessary to meet job conditions and the CEC. They shall be provided as required.

- D. Electrical equipment, outlets, junction and pull boxes shall be installed in accessible locations avoiding obstructions, preserving headroom and keeping openings and passageways clear.
- E. 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 approved by the Architect and detailed on the Record Drawings.
- F. Structural Fittings: Furnish and install the necessary sleeved, inserts, hangers, anchor bolts and related structural items. Install at the proper time.
- G. Openings have been shown on the Architectural and Structural Drawings. Should any additional openings or holes be required for the work of this section, the cost shall be the obligation of this section.
- H. Contractors shall inspect and account for existing conditions affecting his work.
- I. Sleeves for electrical conduits passing through walls or slabs shall be placed under the work of this section before concrete is poured. Where conduits pass through suspended floor slabs, sleeves shall be standard weight galvanized steel pipe extending 2" above the finished floor level.
- J. Sleeves at other locations shall be either light weight galvanized steel pipe or galvanized sheet steel. Clearance between conduits and sleeves shall not be less than 1/2".
- K. Sleeves through outside walls and below grade shall be caulked tight with oakum and the ends sealed with an approved semi-plastic coal tar base compound or shall be of the stuffing box type. Other sleeves shall be packed with glass wood ends sealed with Duxseal and covered with chrome plated escutcheon plates.
- L. Conduits entering through floor slabs at grade level will not require sleeves and shall be placed with tops of couplings flush at floor level.
- M. Sleeves for electrical conduit passing outside walls below grade shall be the through-wall and floor seal type.

3.02 INSTALLATION OF CONDUITS AND RACEWAYS:

- A. Conduits shall be concealed unless otherwise shown. All conduit runs exposed to view, except those in attic spaces, shall be installed parallel or at right angles to structural members, walls, or lines of the building.
- B. All conduit runs shall be mechanically and electrically continuous from outlet to outlet. Conduit size or type shall not be changed between outlets.
- C. No conduits shall be run on the roof unless specifically shown on the roof. They shall be full weight rigid steel or EMT on PVC sleepers. Install roof jacks at penetrations.

- D. Conduit for equipment connected permanently to the floor shall be installed with a 6" rigid conduit nipple to a flush coupling to ensure a watertight connection at the floor.
- E. All conduits shall be sloping to drain and shall be sealed with JM Clipper "Duxseal" on the high end.
- F. All conduit bends shall be carefully made so that the conduit is not flattened, kinked or otherwise compromised. The inner radius of any conduit bend shall be not less than eight times the inside diameter. Where conduits are run exposed in groups, bends of all conduits shall have a common center. Use of standard elbows will not be allowed at these locations.
- I. Each run of a conduit shall be finished before concrete, plaster, etc., is installed to ensure against obstruction or omissions. After installation, the ends of all conduits shall be plugged with metal pennies. All conduit systems shall be completed and thoroughly cleaned and dried inside before installation of any conductors.
- J. Conduits shall enter at right angles and be connected to all outlet boxes, pull boxes, and cabinets with locknuts and plastic throated grounding bushings, providing a continuous grounding system in accordance with CEC Article 250.
- K. Use Erikson couplings where a union is necessary. Running threads will not be permitted.
- L. Pull 1/8" stranded nylon pull ropes with 18" coiled at each end in all empty conduits with identification tags indicating source and destination.
- M. Furnish and install seal-offs in all conduit runs through areas of different temperature.
- N. All concealed conduits shall be installed in as direct a line as possible between outlets. No more than four (4) quarter bends or their equivalent will be allowed between outlets. Feeder conduits shall follow arrangement shown on Plans unless a change is authorized. In general, branch circuit conduits shall follow the arrangement as shown insofar as structural conditions permit.
- O. All exposed runs shall parallel buildings, walls, or partitions, and shall be supported on Kindorf Hangers to meet Title 24 Part 6, California Code of Regulations.
- P. All telephone, data, and other signal conduits shall be installed with long radius sweeps. No factory ells will be permitted.
- Q. Expansion joints shall be provided at building structural expansions or as required due to length of run or difference in temperatures.
- R. All fittings exposed or in damp areas shall have sealing glands and proper gaskets. Fittings in hazardous areas shall be of the type approved for the particular hazard.
- J. Fire Penetration Seals:

1. 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 before, during or after a fire. The fire rating of the penetration seal shall be at least that of which it is installed so that the original fire rating is maintained as required by CEC Article 300.21.
2. Where applicable, provide OZ Type CFSF/1 and CAFSF/1 fire seal fittings for conduit and cable penetrations through concrete and masonry walls, floors, slabs and similar structures. Apply an approved firestopping 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.

3.03 CONDUCTORS AND CONNECTIONS:

A. General Requirements:

1. All branch circuit and fixture wiring joints, splices and taps for conductors #10 and smaller shall be made with UL approved connectors listed for 600 Volts. Connector bodies shall consist of a cone shape rotating expandable coil spring inserts insulated with phenolic or plastic shell.
3. Do not install wire in conduits until all work of any nature that may cause injury (including pouring of concrete) is completed. Use care in pulling in wires to prevent damage to wire or insulation. Do not use blocks, tackle or other mechanical means to pull #8 AWG or smaller conductors.
4. Splices are not permitted except in outlet boxes, pull boxes, junction boxes, panelboard gutters and auxiliary gutters.
5. Use only wire pulling compounds listed by the UL as a lubricant for pulling conductors through raceways. The use of cleaning agents that have deleterious effect on conductor coverings are not permitted.
6. Unless otherwise shown on Plans or specified elsewhere, leave at least 12" of free conductors at each connected outlet (outlets connected to equipment or device) and 9" of free conductors and coil neatly in outlet box for future connection.

B. Terminations:

1. Circuit and signal terminations to single screw or push on terminals shall be done with insulated "Sta-Kons" or approved equal terminals.
2. 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.

C. Feeders and Branch Circuits:

1. Connectors and lugs for terminating stranded conductors sized #8 and larger shall be machine crimp compression type.
2. All splices shall be taped with Scotch "Super 88" vinyl electrical tape, and "Scotch Fill" tape putty where necessary for a smooth joint. For other than normal temperatures or conditions, Scotch #27 or #2520 shall be used.
3. No splices shall be made below grade in a manhole or pull holes without the Engineer's written approval. When approved, these shall be encapsulated with 3M potting kits per 3M Specifications.
4. Wires in panels, cabinets, pullboxes and wiring gutters shall be squared, labeled, and neatly grouped with Ty-raps and fanned out to the terminals.
5. Support all conductors in hand holes/manholes and label with plastic rope. Tag all conductors with plastic waterproof tags.

3.04 WIRING DEVICES:

- A. 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. Provide metal extenders in flammable construction per CEC.
- B. All device screw slots shall be left in a vertical orientation.

3.05 OUTLET BOXES:

- A. Boxes shall be securely fastened in position to the ceiling or walls with screws or bolts. Nails are not acceptable. The Contractor shall set and align all equipment, level, bolt down, or otherwise secure in place. No back-to-back or through-boxes shall be used.
- B. Boxes shall be accurately located and set square and true with exposed edges of a box or plaster ring flush with finished surface of walls or ceiling. All unused boxes shall be equipped with blank covers that shall match existing covers.
- C. Boxes shall have no unused openings.
- D. Boxes shall be cleaned of all direct plaster, etc., before conductors are installed. Rust spots shall be scraped to bare metal and painted with Rust-Oleum "Cold Galvanizing Compound".
- E. Make any change in outlet location necessary to all job conditions and rearrange fixtures and equipment as directed.
- F. Study all Plans as to relation of spaces surrounding outlets so that this work may be installed at the proper time with others. Fixtures and equipment shall be symmetrically located. Conflicts and discrepancies shall be referred to the Architect immediately and prior to box installation.

3.06 JUNCTION AND PULL BOXES AND WIREWAYS:

- A. Boxes shall be installed square and plumb
- B. Pullboxes and wireways shall be concealed or installed flush in finished areas. They shall be surface mounted in machine rooms or unfinished areas.

3.07 TERMINAL CABINETS AND CLOSETS:

- A. Install, level and identify per schedule.

3.08 FLOOR BOXES AND PEDESTALS:

- A. Floor boxes are to be installed level and plumb. Fill with paper prior to pouring concrete. Re-level after concrete has set, then raise to accommodate the floor finish.
- B. The installation of pedestals shall be coordinated with cabinet work.

3.09 IDENTIFICATION

A. Conductors:

1. All power and low voltage systems conductors and cabling shall be identified in accordance with the following schedule:
 - a. 120/208 Volts, 3-phase, 4-wire Wye: Red-Black-Blue, Neutral White
 - b. 120/240 Volts, 3-phase, 4-wire Delta: Black-Blue for single-phase, Orange for 3-phase stinger, Neutral White
 - c. 480/277 Volts, 3-phase, 4-wire Wye: Yellow-Brown-Purple-, Neutral Grey
 - d. Bond or grounding conductor (GWG): Green
 - e. Special system conductors shall be color coded and labeled
2. Brady Labels shall be used to identify terminals and destination of feeders, branch circuits, signal and control circuits, etc., at all terminations and junction boxes and shall be coordinated with the nameplates in all boxes and equipment.
3. 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. Wires #8 and smaller to be terminated on terminal strips squared-type 9080K with white marking strip and screw lugs for wire size.

- B. Nameplates: The Contractor shall furnish and install 1" x 3" x 3/32" thick laminated black Nylon nameplates with a white core, unless specifically shown as red with a white core, 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. The plates shall be screwed in place with stainless steel screws. Adhesive backed plates are not acceptable.
- C. Panels: Panels having single-pole circuit breakers shall be provided with typed schedules mounted in welded metal holders behind plastic.
- D. Devices: All devices shall have their branch circuit identified on the back side of device plate with a permanent type black marker, i.e., CKT A-21.

3.10 CONCRETE PADS, PULL HOLES AND MANHOLES:

- A. Contractor shall provide a minimum of 3'-6" of sand or base material suitable to receive the manhole. The base material shall be compacted, graded level, and at proper elevation to receive the manhole in relation to the conduit grade or ground cover requirements as designated in the Plans.

3.11 SUPPORTS AND ANCHORS:

- A. Provide inserts, anchors, supports, rods, brackets and miscellaneous items to adequately support and secure the electrical systems and equipment.
- B. Secure hangers, brackets, conduit straps, supports and electrical equipment to surfaces by means of toggle bolts on hollow masonry. Utilize expansion shields and machine screws or standard preset inserts on concrete or solid masonry. Utilize machine screws or bolts on metal surfaces. Utilize wood screws on wood construction. Wood, fiber plugs, or concrete nails are not acceptable.
- C. Power or velocity driven inserts may not be used for any anchorage unless specifically approved by the Engineer and where the use does not affect the finished appearance of work. Under no circumstance shall these be used in pre-stressed slabs, beams, purlins, or precast members in tension.
- D. Seismic Requirements: Provide vertical and lateral supporting equipment to resist the application of seismic forces per California Code of Regulations, Title 24 Chapter 23.

END OF SECTION

SECTION 26 40 00
LOW VOLTAGE ELECTRICAL TRANSMISSION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 - Specification sections, apply to work of this section.
- B. Section 26 05 00 - section and other Division 26 sections apply to work specified in this section.

1.02 SCOPE:

- A. Work included: Furnishing and installation of a complete electrical service, distribution, and grounding system. Conditions of this section apply to all other 26 40 00 series sections included.
- B. Related Work: Refer to other sections, particularly those listed below, so as to properly coordinate work specified herein with that specified elsewhere to produce a finished, workmanlike, fully functioning installation.
- C. All other Electrical Sections: Division 26

1.03 QUALITY ASSURANCE:

See Section 26 05 00.

1.04 SUBMITTAL:

- A. Product Data: Submit manufacturer's data on service entrance equipment, switchboards, motor control centers and/or individual starters, transformers, panelboards, disconnect switches and grounding components.
- B. Trip Curves: When requested, submit trip timing curves for all circuit interrupting devices.
- C. Nameplate Schedule: Submit nameplate schedule for approval.

1.05 COMPONENT COORDINATION:

In order to maintain close control and coordinate the various components of the distribution systems, the number of manufacturers shall be kept to a minimum. Equipment manufacturer shall be General Electric or Square D. It shall be the manufacturer's responsibility though the Electrical Contractor to coordinate all components of the system in order to ensure systems that will provide maximum protection of equipment and reliable safe operation.

1.06 NAMEPLATES:

Laminated phenolic plastic, color coded black for 120/208 volt equipment, with white letters. Provide for identification of each transformer, panelboard and motor control center, secure to face with two (2) chrome plated screws each. A schedule of nameplates shall be included with the shop drawings for approval.

1.07 FEEDER CONNECTIONS:

Provide cast, saddle type bolted lugs or hydraulically set compression lugs for all bus connections. Manufacturer shall be Thomas and Betts, Burndy, O.Z. or approved equal. Lugs in which the set of screw embeds directly into feeder conductor shall not be used.

1.08 MISCELLANEOUS:

- A. Equipment Bases: Provide appropriately sized concrete housekeeping bases for all floor-mounted equipment.
- B. Hoisting Lifting Lugs: Provide on all heavy equipment as required to ensure safe hoisting.
- C. Space for Future Protective Device: Provide as indicated on drawings; shall be completely equipped for the future addition of a circuit breaker or fused switch, including all connections.

PART 2 – PRODUCTS

2.01 PANELBOARDS:

- A. Panelboards shall be Bolt-down Circuit Breaker type, with voltage, phase, and breakers as specified in panelboard schedules. Panelboards shall be installed flush or surface or specified, at locations as indicated on plans. Panelboards shall be installed in code gauge rust proof steel cabinets with flush door having flush locks all keyed alike and with trim cut square and true.
 - 1. Panelboards: General Electric A-Series and Spectra Series; Square D, type NQ, NQOB, and NF; or approved equal.
- B. All panelboards and breakers shall meet the requirements of the indicated available symmetrical short circuit current or have a minimum bus bracing to meet figure shown.
- C. All interiors shall be completely factory assembled. They shall be so designed that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors, so that circuits may be changed without machining, drilling or tapping.
- D. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. A nameplate shall be provided listing panel type and ratings.

- E. Unless otherwise noted, full size insulated neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral bussing shall have a suitable lug or each outgoing feeder requiring a neutral connection. A ground bus will be included in all panels.
- F. Boxes shall be at least 20 inches wide made from galvanized steel. Provided minimum gutter space in accordance with California Electric Code. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.
- G. Door hinges shall be concealed. All locks shall be flush, stainless steel, cylinder tumbler type locks with catches and spring loaded door pulls, keyed alike and directory frame and card having a transparent cover shall be furnished with each door.
- H. All exterior and interior steel surfaces of the trim shall be properly cleaned, primed with a rust inhibiting phosphatized coating and finish with a gray ANSI 61 paint. Trims for flush panels shall overlap the box for at least 3/4 inch all around. Surface trims shall have the same width and height as the box. Trims shall be mountable by a screwdriver without the need for special tools. After installation, trim clamps shall not be accessible when the panel door is closed and locked.
- I. All main bus bars shall be cooper or tin plated aluminum sized in accordance with UL standards to limit the temperature rise on any current carrying part to a maximum of 50 degrees C above an ambient of 40 degrees C maximum.
- J. Circuit breakers shall be quick-make, quick-break, thermal-magnetic, trip indicating, and have common trip on all multipole breakers. (Trip indication shall be clearly shown by the breaker handle taking position between ON and OFF when the breaker is tripped). Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip rating of the breaker to prevent repeated arcing shorts resulting from frayed appliance cords. Single pole 15 and 20 ampere circuit breakers shall be UL listed as "Switching Breakers" and carry the SWD marking. UL Class A (5 milliampere sensitivity) ground fault circuit protection shall be provided on 120V ac branch circuits as specified on the plans or panel board schedule. This protection shall be an integral part of the branch circuit breaker which also provided overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit breaker containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole breaker containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional slide pole circuit breaker. Connections to the bus shall be bolt on.

2.04 DISCONNECTS:

- A. Motor and circuit disconnects shall have an Underwriters' Laboratory label.

- B. Disconnect switches shall be suitable for area where they are installed, i.e., weatherproof, and shall be rated heavy duty. Use only 600 volt class with proper number of poles. Switches shall be fused unless indicated on plans. Fuses shall be of type specified on plans.
- C. When a disconnect switch is not clearly visible from the control location, provide an operating handle which is lockable in the open position.

2.05 GROUNDING:

- A. Clamps, bonds, etc. suitable and as necessary to provide continuous ground system.
- B. Ground Rods: "Copperweld" 3/4" diameter 8' long.
- C. All grounding conductors shall be copper, sizes not less than that required under CEC Table 250.122.
- D. All grounding electrode conductors shall be copper, sizes not less than that required under CEC Table 260.66.

2.06 SWITCHBOARDS:

- A. Manufacturer's: Subject to compliance with requirements, provide switchboards of one of the following:

General Electric Company
Square D Company
- B. General: Except as otherwise indicated, provide switchboards of types, sizes, characteristics, and ratings indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for complete installation. Service entrance switchboards shall comply with serving utility requirements.
- C. AC Dead-Front Distribution Switchboards: Provide factory assembled, dead-front, metal enclosed, self-supporting secondary power switchboards, of types, sizes and electrical ratings and characteristics indicated; consisting of panel (vertical) units, and containing circuit breakers of quantities, ratings and types indicated. Provide copper or tin plated aluminum main bus and connections to switching devices of sufficient capacity to limit rated continuous operating temperature rise to 54 degrees F, and 90 degrees F for circuit breaker branches; with main bus and tap connections silver-surfaced and tightly bolted for maximum conductivity. Brace bus for short circuit stresses up to maximum interrupting capacity. Prime and paint switchboard with manufacturer's finish and color. Construct units for outdoor, NEMA Type 3R.
- D. Enclosures: Construct dead-front switchboards, suitable for floor mounting, with front cable/wire and conduit accessibility as indicated. Provide welded steel channel framework, hinge wireway front covers to permit ready access to branch

circuit breaker load slide terminals. Coat enclosures with manufacturer's standard corrosive resistant finish.

- E. Bussing: Provide switchboard with sufficient cross-sectional area to fulfill U.L. Standard 891 pertaining to temperature rise.

2.06 MOTOR STARTERS:

- A. Manual motor starters to be quick-make, quick break, with overload protection. General Electric cr 101 for 120/240 volt 1 hp or less.
- B. Magnetic motor starters shall be across the line unless indicated with control power transformer (120 volt coil) and with overload relay protection. Combination type shall have integral fused switch or circuit breaker as indicated.

2.07 TRANSFORMERS:

- A. Transformers, Dry Type: Distribution transformers shall be constructed and tested in accordance with ASA and NEMA Standards, TP-1 minimum, and shall be wound with copper or aluminum conductors. Performance of transformers shall be equal to or exceed ASA and NEMA published criteria.
- B. Transformers shall be self-cooled type with Class H, NEMA, Group 111 insulation and a temperature rise of 150°C under continuous full load conditions with an ambient of 400°C.
- C. Transformers supplying voltage to wave altering devices (computers, electronic ballasts, etc.) shall be K3 rated minimum, or as noted otherwise on plans.
- D. Transformers shall be equipped with four 2 1/2% taps (2 taps above and 2 taps below normal voltage). Windings shall be of the fire-resistant type, designed for natural convection cooling through normal air circulation.
- E. Core mounting frames and enclosures shall be of welded and bolted construction with sufficient mechanical strength and rigidity to withstand shipping, erection and short circuit stresses.
- F. Enclosure cover plates shall be Code gauge sheet steel, captive bolted to the enclosure framework. Enclosure shall have suitable ventilating openings with rodent-proof screens. Enclosure shall be provided with lifting lugs and jacking plates as required.
- G. Transformers shall be furnished complete with mounting channels and mounting bolts. Metal parts, except cores and core mounting frames, shall be cleaned, rust-proofed and given a heavy coating of an inert primer.
- H. Transformers used indoors shall be "low noise." They shall be provided with vibration dampers. Size and number of shock mounts shall be in accordance with manufacturer's recommendations.
- I. Transformers shall be manufactured by General Electric, Square D, or approved

equal.

PART 3 – EXECUTION

3.01 INSTALLATION OF SWITCHGEAR AND SWITCHBOARDS:

- A. Install switchgear and switchboards as indicated, in accordance with manufacturer's written instruction, and with recognized industry practices to ensure that switchboards comply with requirements of NEMA and CEC standards, and applicable portions of NECA's "Standard of Installation".
- B. Prior to energization of circuitry, check all accessible connections to manufacturer's torque specifications. Subsequent to wire and cable hook-ups, energize switchboards and demonstrate functioning in accordance with requirements.

3.02 INSTALLATION OF PANELBOARDS:

- A. Provide mounting brackets, busbar drilling, and filler pieces for unused spaces.
- B. Branch circuits shall be connected as shown in line diagrams and/or panelboard schedules, with wires neatly tie wrapped in panel.
- C. All distribution panelboards shall have all sub feeders and main breakers marked with 1" x 3" plastic name tags secured with two self tapping screws.
- D. All panelboards shall be provided with a 2" x 3-1/2" plastic name tag on the front of the panel door or on the trim, indicating panel designation and distribution panel and circuit feeding above panel, secured with two self tapping screws.
- E. Branch circuit panelboards shall have a plastic covered circuit directory card on the inside of each door with all circuit destinations neatly typed.
- F. Contractor shall check and tighten all factory made wire or lug connections. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A.
- G. Install four (4) spare 3/4" conduits from all panelboards to accessible ceiling space.

3.03 INSTALLATION OF DISCONNECTS:

Install disconnects for all equipment and motors of the size required and as recommended by manufacturer.

3.04 INSTALLATION OF GROUNDING:

- A. Scope: Provide grounding system complying with the codes and ordinances

specified. Grounding system shall provide continuity through the entire electrical system.

1. Panelboard ground buses.
 2. PVC conduit or other raceways.
 3. All motors.
 4. All lighting fixtures.
 5. Grounding terminals of all receptacles.
 6. Miscellaneous grounds required by code.
- B. Equipment and raceway bonding procedures shall be rigidly maintained and meet all jurisdictional requirements of codes and regulations.
- C. Good, electrically continuous, metal to metal contacts shall be made wherever possible at all panel boxes, pull boxes, etc. Where it is not possible to obtain good contacts, the conduit shall be bonded round the boxes with a 6 BS gauge, rubber covered, double braided wire with ground clamps.
- D. A separate grounding conductor shall be run in all conduit runs from distribution, lighting, and power, etc. panelboards, motor control outlets, etc., back to their respective service or distribution panelboards.
- E. Flexible Conduit Grounding: Provide a separate grounding conductor in all flexible conduit runs to include watertight flexible conduit with integral grounding straps. Install ground conductors inside conduit with ungrounded conductors. Extend from nearest panel to device being connected.
- F. Receptacle Circuits: Provide a separate grounding conductor in all receptacle circuit conduit runs, back to serving panelboard.

3.05 INSTALLATION OF MOTOR STARTERS:

- A. In finished areas, mount motor protection switches flush and install suitable cover plates.
- B. Install heaters correlated with full load current of motors provided.
- C. Set overload devices to suit motor provided.

3.06 INSTALLATION OF TRANSFORMERS

- A. Transformer core frame shall be installed level on shock absorbing pads within the enclosure.
- B. Mounting bolts on floor-mounted transformers shall be extended into pads only and shall not be in direct contact with building structural members.

- C. Flexible jumpers shall be installed for grounding continuity from enclosure to conduits.
- D. Voltage Check:
 - 1. The Contractor shall set the taps on all transformers (which are a part of this contract) as necessary to provide satisfactory operating voltages with all present loads energized. A check shall be made in the presence of the District Inspector at a panel fed from each transformer and which is the farthest from the transformer. Voltages at the transformers ranging from 118 to 122 volts inclusive, for 120-volt systems and proportionately equivalent for higher voltage systems, are acceptable.
 - 2. The Contractor shall provide all instruments and accessories required to perform the checks. Volt meters shall be accurate within 1% and shall have scales permitting the voltage readings to be made on the upper half of the scale.

3.07 CONNECTIONS TO NEW MANHOLES

Construct concrete-encased duct lines connecting to underground structures to have a flared section adjacent to the manhole to provide shear strength. Construct underground structures to provide for keying the concrete encasement of the duct line into the wall of the structure. Use vibrators when this portion of the encasement is poured to ensure a seal between the encasement and the wall of the structure.

3.08 CONNECTIONS TO EXISTING MANHOLES

For duct line connections to existing structures, break the structure wall out to the dimensions required and preserve steel in the structure wall. Cut steel and bend out to tie into the reinforcing of the duct line encasement. Chip out the structure wall to form a key for the duct line encasement.

END OF SECTION

SECTION 26 25 00
AUTOMATIC EMERGENCY POWER SYSTEM

PART 1 – GENERAL

1.01 SCOPE

The Contractor shall furnish, install and test the two complete emergency power systems specified herein capable of operating continuously for any duration of utility power failure. The system shall be complete with engine-generator sets, automatic transfer switches and fuel provisions, and necessary accessories as specified herein. The system shall be, diesel driven, rated at KW, as indicated on drawings, nominal at 1000 ft. elevation and shall be permanently connected and fixed to a concrete base.

1.02 POWER REQUIREMENTS

The electric power system shall be rated for continuous standby service at rated voltage and KW shown on drawings and KVA rating of 1.25 times the KW rating at 0.8 PF.

1.03 MANUFACTURER

- A. The engine and generator shall be the product of a manufacturer who has been regularly engaged for a period of at least 10 years in the production of the type and size of equipment required to be furnished as herein specified. All materials and parts in this unit shall be new and unused, of current manufacture, and of the highest grade, and free from all defects affecting performance.
- B. The performance of the engine-generator set, support equipment, control panel, and accessories shall be the sole responsibility of the engine-generator manufacturer and its authorized dealer.

1.04 SUBMITTALS AND SHOP DRAWINGS

- A. Submittals shall be in accordance with the Standard General Conditions and the Supplementary Conditions.
- B. The Contractor shall submit for review the following information in tabular form:
 - 1. Drawings of the generator set and auxiliary assembly showing all piping and wiring connections at the unit.
 - 2. Dimensional and wiring drawings of electrical controls and switchboard.
 - 3. Literature describing all the major components of the unit and auxiliaries.
 - 4. A certified performance rating from the engine manufacturer that the generator set when equipped with an auxiliary equipment as needed or specified shall have a minimum rating as specified in Special Requirements.
 - 5. Actual torsional vibration data (not calculations) shall be made available upon request from Engineer.

1.05 PARTS AND SERVICE AVAILABILITY

- A. The Manufacturer through its authorized Dealer Company shall provide the sales, installation start-up, & service. The company shall be one which has a good reputation in the sales and service of the equipment being proposed, for a minimum of the three previous years in this geographical area.
- B. The Company shall have a complete stock of normally needed repair/service parts and factory-trained service personnel available 24 hours a day, and shall be located within 50 miles of the proposed site.
- C. Upon request, the Company shall provide references of similar installations to the owner, which will be used in the evaluation of this award.

1.06 TECHNICAL MANUALS

The Contractor shall furnish three sets of maintenance, operating, and parts manuals covering the engine-generator and accessories, and complete wiring diagrams of control panel as built. The manuals shall be forwarded to the Engineer for his review.

1.07 TESTING

A. GENERAL

The intent of this specification is to provide equipment of proven reliability and compatibility. Three separate series of tests shall be performed: Factory Prototype Model Tests, Factory Production Model Tests, and Field Tests.

B. ENGINE GENERATOR

- 1. Factory Prototype Model Tests: The power system consisting of prime mover, generator, transfer switches, and all necessary controls must be tested as complete systems on representative engineering prototype models. The tests, being potentially damaging to the equipment tested, must not be performed on equipment sold, but on separate prototype models. A certificate certifying that prototype testing has been accomplished shall be submitted along with submittal data for approval.
- 2. Factory Production Model Tests: Before shipment of the equipment, the generator set, transfer switch, and system components shall be tested under rated load and power factor for performance and proper functioning of control and interfacing circuits. Testing at unity power factor only (resistance banks only) is not acceptable, since KW output is affected by the higher generator efficiency at unity power factor, and the KVAR for motor starting and regulation is not correlated between unity and rated power factor.
- 3. The Engineer shall be notified in advance of these tests, and shall have the option of witnessing these tests. Certified copies of test results shall be forwarded to the Engineer for review, when requested.

C. AUTOMATIC TRANSFER SWITCH

1. Factory Prototype Model Test: Representative production samples of the transfer switches supplied shall have demonstrated through tests the ability to withstand at least 10,000 mechanical operation cycles. One operation cycle is the electrically operated transfer from normal to emergency and back to normal.
2. The transfer switch supplied for this project shall have a minimum withstand and closing ratings (amperes) obtained without contact welding, and shall be the ratings listed in the UL listing or component recognition procedures for the transfer switch supplied.

1.08 WARRANTY

- A. The complete standby electric power system, including 1800 RPM engine-generator set equipped with set exerciser, running time meter, and automatic transfer switch shall be warranted for a period of five (5) years or fifteen hundred (1,500) operating hours, whichever occurs first, from the date of initial start-up.
- B. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable.
- C. Satisfactory warranty documents must be provided and shall be as detailed in available written documents.
- D. In the judgement of the specifying authority, the manufacturer supplying the warranty for the complete system must have necessary financial strength and technical expertise with all components supplied to provide adequate warranty support.

PART 2 – PRODUCTS

2.01 ENGINE

A. GENERAL

1. The engine shall be diesel driven, 4-cycle.
2. The governed speed shall not be greater than 1800 rpm.
3. The engine shall develop not less than 1.55 hp per kw or rated generator output at 300 meter altitude and 40 degrees C ambient.

B. ENGINE

1. Engine design shall include:

- a. Overhead valves with cast-iron, one-piece cylinder block. Replaceable exhaust valve seat inserts.
- b. Main bearings for crankshaft between each cylinder and camshaft bearings for minimum distortion during operation.
- c. Rated speed up to 3600 RPM for extra long life at the operating speed of 1800 RPM in this application.
- d. Designed for single side servicing to allow one side of generator set to be located close to wall.

C. AIR CLEANER

The air cleaner shall be engine-mounted dry-type of sufficient capacity to protect engine working parts from dust and grit. Provide spare air cleaner.

D. FUEL SYSTEM

- 1. The engine shall be capable of satisfactory operation at 1000 ft elevation on diesel fuel.
- 2. The engine shall have separate replaceable fuel injectors for each cylinder and replaceable element fuel filter conveniently located for servicing and easily replaceable.

E. LUBRICATION SYSTEM

- 1. The engine shall be equipped with positive displacement gear-driven lubricating oil pump.
- 2. The system shall include effective full-flow oil filters with replaceable elements conveniently located for servicing and easily replaceable.
- 3. The system shall include an easily accessible dipstick, drain, and a vent which does not require external plumbing, and an accurate means of indicating lubricating oil level while unit is in operation. Lubricating oil system shall be filled with the manufacturer's recommended oil.

F. GOVERNING SYSTEM

- 1. Engine speed shall be controlled by an adjustable electronic governor.
- 2. The governor shall be fully enclosed and self-lubricated.
- 3. The governed speed shall be maintained from 2 percent above rated speed at no load to rated speed at full load, with a steady state band width at any load of +0.5 percent of rated speed.

G. SHUT-DOWN CONTROLS AND INSTRUMENTS

1. The engine shall be equipped with the following automatic electrical safety shut-down controls:
 - a. low oil pressure
 - b. high water temperature
 - c. overspeed
 - d. overcranking
2. Safety shut-down controls shall be of fail-safe design and operate from engine starting battery.
3. General alarm contact, energized via battery power, shall be run the the PLC for trouble and alarm.

H. COOLING SYSTEM

1. The engine shall be equipped with radiator cooling system. The cooling system shall have sufficient capacity to cool engine when developing horsepower, and operating under conditions specified.
2. The engine shall be equipped with engine-driven water circulating pump and a thermostatic valve to maintain engine at proper operating temperature.
3. The cooling system shall be equipped with a replaceable element corrosion resistor to control acidity and remove corrosion.
4. The radiator shall be equipped with engine-driven blower fan.
5. The cooling system shall be filled with water and ethylene glycol antifreeze with rust inhibitor sufficient to prevent freezing to -20 deg. F.

J. EXHAUST SYSTEM

1. A suitable silencer or silencers of residential grade shall be furnished. A 12-inch minimum length flexible stainless steel exhaust adapter shall be furnished between each exhaust outlet and silencer.
2. Exhaust piping shall not be smaller than engine exhaust manifold connection. All exhaust pipe bends shall be long sweep ells. Piping shall be Schedule 40 flanged black iron pipe
3. The exhaust system termination shall be equipped with effective weather cap to prevent entrance of rain, and a condensate drain.
4. Engine noise shall not exceed 85 dBA at 30 feet.

K. STARTING AND ELECTRICAL SYSTEM

1. The engine shall be equipped with DC electrical starting systems of sufficient capacity to crank engine to full starting speeds of ambient temperatures of -20 degrees F and above.
2. The engine shall be capable of being started and accepting full loads within 10 seconds.
3. The engine shall be equipped with charging generator, to be sized both to recharge batteries and run engine electrical auxiliaries.
4. Batteries shall be heavy-duty lead-acid and of sufficient capacity to start the engine under the conditions as specified above and of sufficient capacity to operate all accessories. Batteries shall be securely rack-mounted and with a pan to catch spilled electrolyte. Battery capacity shall be 74 ampere hours minimum.
5. The battery charger shall have 120-volt, 1-phase AC line compensated input, DC regulated, and current limited output capable of recharging battery from a fully discharged condition in 24 hours. The battery charger shall be equipped with all standard accessories, a 0-24 hour equalizing timer, voltmeter, ammeter, and be enclosed in a substantial metal cabinet securely mounted within the transfer switch.
6. The engine shall be equipped with a jacket water heater with thermostat to maintain engine water at 100-120 degrees F.

2.02 GENERATOR

A. GENERAL

1. The A-C generator shall be rated for 105 degrees C temperature rise at 40 degrees C ambient (Class F insulation)
2. Design shall be 4-pole, revolving field, brushless.
3. The generator shall be a single-bearing machine conforming to applicable NEMA standards and shall have a rigid drip-proof frame with covers to provide easy access to the interior.
4. Generator shall be directly connected to the engine with flexible coupling.

B. ROTOR

The rotor shall be dynamically balanced for up to 25 percent overspeed, and equipped with full amortisseur windings. Rotor and drive shall be free from torsional vibration within the operating speed range.

C. EXCITATION

The exciter shall be of rotating brushless design. The excitation system shall

include provision to permit voltage buildup from residual magnetism. All rectifiers shall be silicon.

D. VOLTAGE REGULATION

1. The voltage regulator shall be of all solid state modular design, of silicon controlled rectifiers with phase controlled sensing circuit.
The voltage regulator shall be capable of maintaining the following conditions:
 - a. Steady state regulations of +1.0 percent of rated voltage from no load to full load.
 - b. Steady state voltage stability of +1.0 percent.
2. The regulator shall include a voltage damper control adjustable from 0 to 4 percent and a remote control panel mounted calibrated voltage adjusting rheostat control capable of a +1 percent range of control centered on rated supply voltage.

E. CONTROL PANEL

1. The generator control panel shall contain the following engine and generator controls and instruments:
 - a. Engine-generator control shall include the following DC engine controls for each unit: run-stop-remote switch; remote start-stop terminals; lighted oil pressure gauge; lighted coolant temperature gauge; lighted battery charge rate ammeter; running time meter; pre-heat switch (glow plugs).
 - b. Provide field circuit breaker (manual reset).
 - c. All wiring for connection to remote devices (including automatic transfer switch) shall be wired to properly numbered and labeled terminal blocks. Contractor shall install stranded wires to all remote devices.
 - d. Provide glow plugs which automatically energize upon loss of normal power for reliable starting.
 - e. Provide cranking limiter with 45 second cranking cycle with lockout.
 - f. Provide solid-state voltage regulator.
 - g. Nine-light generator set monitoring system shall include solid-state engine monitor with individual lights and one common external alarm contact, indicating each of the following conditions for each unit: run (green light); overcrank shutdown (red light); overspeed shutdown (red light); high coolant temperature shutdown (red light); low oil pressure shutdown (red light); high coolant temperature

pre-alarm (yellow light); low oil pressure pre-alarm (yellow light); low coolant temperature (red light); switch OFF (flashing red light) - indicates generator set not in automatic mode). Monitoring system shall include lamp test switch and reset switch for manual reset of tripped condition. Provide 24VDC operated relay for common generator alarm and trouble.

- h. Meter and control package shall include: AC ammeter (dual range, indicates current each phase); voltmeter; voltmeter-ammeter phase selector switch (with an OFF position); frequency meter; console mounted voltage adjusting rheostat.

- 2. The control panel shall be equipped with all nameplates necessary to fully explain all instruments and controls and small operating light with integral switch operated from starting battery circuit.

2.03 ENCLOSURE

- A. Provide Level 2 sound attenuated weatherproof enclosure. Provide adequate sound attenuation and ventilation for combustion and cooling.
- B. Provide all weatherproofing and flashing as required.
- C. Provide integral engine generator emergency work lights.

2.04 FUEL CONNECTION

Provide diesel base tank with fuel lines to engine generator and connected per manufacturer's requirements. Fuel tank shall be sized for minimum 36 hours of operation at 100% loading.

2.05 ELECTRICAL CONNECTIONS

- A. Provide a single main circuit breaker in the generator, sized per drawings.
- B. Provide permanent connections for power, start controls, battery charger circuit, and jacket heater circuit.

2.06 STANDBY POWER AUTOMATIC TRANSFER SWITCH

- A. The Contractor shall provide an automatic transfer switch, to be mounted within the Switchboard/MCC, which shall include all necessary control devices and circuitry in order to:
 - 1. Supply normal power when normal power is available.
 - 2. Detect sustained loss or deterioration of "normal" power.
 - 3. Signal the standby engine-generator to start and run when "normal" power fails.

4. When "standby" power from the generator is within proper limits of voltage and frequency, transfer in order to supply "emergency" power to electrical distribution equipment.
 5. Detect sustained restoration of "normal" power within proper limits of voltage and frequency.
 6. Retransfer in order to supply "normal" power to the distribution equipment.
 7. After a period of unloaded operation of the generator, signal the engine control panel to shut down the engine.
- B. The transfer switch, together with all controls and accessories shall be rated for continuous (24-hour) duty in an unventilated steel enclosure. The switch shall be required poles, double throw, having the "normal" and "emergency" positions mechanically interlocked, and shall be suitable for application to the service characteristics of the electrical system.
- C. Main and auxiliary contacts shall be attached to a vertical single shaft, and be positive, quick-make, quick-break high pressure type that provide continuous operation, long life and resistance to burning, pitting and welding. Contact design and arrangement shall permit repeated making and breaking of full-load current, in a combination of motor and other loads, without damage to the main contacts. Circuit breaker type transfer switches are not acceptable.
- D. Loss of power, or failure to any component during the transfer operation, shall not allow the switch to stop or hold in any mid- position. All switch and relay contacts, coils, springs, and control elements shall be serviceable or removable from the front of the mounted switch and accessory assembly without the removal of either assembly from its compartment and without disconnection of drive linkages, power conductors, or control conductors.
- E. The transfer switch shall be rated to withstand a short circuit current of 65,000 amperes (symmetrical) without parting of the switch contacts.
- F. Ratings: Transfer switch shall be UL listed per Standard 1008. Transfer switch supplied shall be suitable for use on emergency and legally required standby systems in accordance with ANSI-CI and NFPA 76A, rated for total system load (including motor loads, electric discharge lamps, restrictive loads, and tungsten lamp loads as described in Section 1 of UL Standard 1008. Transfer switch shall be rated to carry 100 percent of its rated current continuously in the enclosure. Transfer switches which must be derated when installed inside enclosures (due to integral overcurrent devices or any other reasons) do not meet this specification. Transfer switch shall be rated for continuous operation in ambient temperatures of -40 degrees C (-40 degrees F) to +67 degrees C (+142 degrees F). Main power switch contacts shall be rated for 600 VAC.
- G. There shall be included with the transfer switch the following control, accessory and additional features, all of which shall be fully wired (and shown as such on shop drawings) at the factory.

1. Full-phase relay protection: Adjustable relays shall be control, phase-to-phase to monitor voltage, one on each phase. Sensors shall be differential relay set to drop out at 85% and pick up at 95% of nominal voltage. On the standby side, a voltage sensor frequency sensitive relay shall be provided such that transfer is affected only if standby source voltage and frequency are 90% of rated or higher.
2. Test switch: A test switch shall be provided which shall cause the automatic transfer switch to start the engine, transfer, retransfer, and the like, simulating a power outage; this switch shall be mounted on the door of the transfer switch unit.
3. Engine-starting contact: Subject to engine-starting delay (see below), contact shall close to call for engine to start following loss or deterioration of "normal" power; subject to unloaded operation feature (see below), contact shall reopen to cause engine to shut down.
4. Engine-starting delay: Following loss or deterioration of "normal" power, delay closure of engine-starting contact for an adjustable period up to 10 seconds, to eliminate starts during brief or momentary outages of "normal" power.
5. Retransfer delay: Adjustable delay from 2 up to 25 minutes before retransfer to "normal" power; if "standby" power fails before preset delay period elapses, and if "normal" power is within set limits of voltages, override the delay and retransfer immediately; initial setting shall be for 5 minute-delay.
6. Indicating lights: One each to indicate the switch is supplying "normal" or "standby" power; label each with plastic nameplate engraved "NORMAL" and "EMERGENCY", respectively; these shall be mounted on the door of the transfer switch.
7. Unloaded generator operation: Following retransfer to "normal" power, maintain engine in unloaded operation for a fixed period of 5 minutes before signaling it to shut down.
8. Auxiliary contacts: One spare normally closed and one normally open contact shall be provided.
10. Retransfer bypass: Provide an automatic bypass to retransfer the load from generating set to normal source if generating set output interrupts after normal source restores voltage.
11. Battery charger: Provide a SCR voltage regulated, current limited float charger, to maintain fully charged cranking batteries.
12. Control disconnect: Provide a device to electrically disconnect the control section from the transfer switch for maintenance service during normal operation.

13. Controls shall provide built-in "control mode status indicators", consisting of L.E.D.'s to indicate a sequence of functions such as the following:

- a. Source 1 OK
- b. 2-Wire Run
- c. Source 2 OK
- d. Timing for Retransfer
- e. Transfer Command
- f. Timing for Retransfer
- g. Retransfer Command
- h. Timing for Stop

These indicators shall allow the operator to determine that the controls are properly sequencing and shall assist in determining sequence of any malfunctions that might occur.

2.07 MANUFACTURER

- A. Engine-generator set shall be manufactured by Cat., Kohler, or approved equal.
- B. Bidders taking exception to specifications must receive approval in writing 10 days prior to bid date.

PART 3 – EXECUTION

3.01 EXECUTION

- A. The installation shall comply with manufacturer's instructions in all details.
- B. Furnish letter from manufacturer or manufacturer's agent certifying installation is in compliance at completion of work.
- C. The engine-generators set shall be rigidly mounted to maintain alignment on steel skid base and be equipped with lifting holes or lugs.
- D. Provide Cal Dyn type vibration isolators to mount fixed engine generator. Secure vibration isolators to concrete pad with quick bolt 3 anchors as furnished with Cal Dyn vibration isolators.
- E. Make all fuel, exhaust, and electrical connections with flexible sections.
- F. Coordinate installation such that code working clearance is maintained in from of control panel.

3.02 FIELD TESTS AFTER INSTALLATION

- A. The complete installation shall be initially started and check out for operational compliance by a factory trained representative of the manufacturer of the generator set and the automatic transfer switch.
- B. Upon completion of initial start-up and system check-out, the supplier of the generator set shall perform a field test, with the Engineer notified in advance, to demonstrate load carrying capability, stability, voltage, and frequency.
- C. Provide the following field tests: Cycle crank per NFPA 110 Sec 5-13.2.8; All safeties required by NFPA 110 Sec. 5-13.2.9; Cold start and 2-hour test with building load per NFPA 110 Sec. 5-13.2.3; and 2-hour test with full load per NFPA 110 Sec. 5-13.2.5. Records shall be maintained throughout this period to record water temperature, oil pressure, ambient air temperature, voltage, current, frequency, kilowatts and power factor. Three copies of the field test data shall be furnished to the Engineer. The contractor shall make all necessary hook-ups to accomplish field tests and shall furnish all fuel necessary for field test.
- D. Provide all required permits with the San Joaquin Valley Air Pollution Board.

END OF SECTION 26 20 00

SECTION 26 50 00
LIGHTING FIXTURES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Work Included: Furnish and install lighting fixtures including lamps; connect fixtures to circuits, occupancy sensors, relays, room controllers, contactors, control panels, and gateways, where applicable.
- B. Related Work:
 - 1. Common Work Results for Electrical: Section 26 05 00.
 - 2. Low Voltage Electrical Transmission: Section 26 20 00.

1.02 SUBMITTALS

- A. All submittals shall be made in accordance with Division 1 Submittal Procedures.
- B. List of Materials: Submit a complete list of material proposed for this Section.
- C. Shop Drawings for Lighting Fixtures: Provide detailed and dimensioned working drawings showing kind, weight and thickness of materials, method of fitting and fastening parts together, location and number of sockets, size and color of lamps, and complete details of the method of fitting, suspension and securing the fixtures in place. Drawings shall contain sufficient information to enable a workman to construct and install the fixtures without further instructions.
- D. Shop Drawings for Lighting Controls: Provide detailed and complete wiring diagrams and plans for lighting controls. Provide cut sheets for lighting control devices and cabling.

1.03 MOUNTING REQUIREMENTS

Comply with State of California earthquake requirements and CEC requirements for lighting fixture installations and support.

1.04 GUARANTEE

- A. Guarantee lighting components against service failure for five years

PART 2 – PRODUCTS

2.01 MATERIAL AND FABRICATION

- A. Each lighting fixture shall be the type indicated on the drawings and as specified herein. Fixtures of the same type shall be of identical make, design and appearance. The size of each lighting fixture shall be as specified herein for the lamp or fixture wattage indicated on the drawings.

- B. The design of all lighting fixtures, accessories and supports, as well as the method of hanging fixtures, shall comply with all requirements for earthquake resistant construction of the State of California.

2.02 LIGHT FIXTURES

- A. LED Drivers: Drivers shall be electronic type specifically designed to save energy while maintaining full light output. Drivers shall have "A" sound rating, thermal protectors and guaranteed against service failure for three years. Drivers shall comply with FCC and NEMA limits governing electromagnetic and Radio Frequency Interference and meet all applicable ANSI, State and Federal standards. Drivers shall be noiseless, high power factor type and shall be ETL certified under CBM Standards and Underwriters' Laboratory listed.
- B. LED Diodes shall have the following minimum characteristics:
 - 1. Efficacy – 100 lumens per watt or greater
 - 2. Color rendition index – 80 or greater
 - 3. Standard deviation color matching for diodes shall fall within 1 MacAdam ellipse.

2.03 LIGHTING CONTROLS

- A. Lighting controls and control systems shall meet all requirements of the State of California Title 24 energy code.
- B. Lighting control systems shall be commissioned by a Title 24 Certified Commissioning Agent.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install lighting fixtures where shown on plans.
- B. Fixture voltage shall be as shown on drawings and in the fixture schedule.
- C. Install recessed and surface-mounted fixtures with mounts or plaster frames compatible with the ceiling and wall systems employed and secure fixtures mechanically to frames.
- D. Align rows of surface-mounted fluorescent fixtures to form straight lines at uniform elevations. Provide factory joiner bands for contiguous fixtures, and end caps on ends.
- E. Recessed fixtures shall fit snugly against ceilings to prevent light leakage.

- F. Support suspended recessed fixtures in a T-bar ceiling as follows: All fixtures shall be attached to the ceiling grid to resist a horizontal force equal to the weight of the fixtures. For heavy duty grid systems, fixtures weighing less than 56 pounds must also have two 12 gauge slack safety wires from diagonal corners to the structure above; fixtures weighing more than 56 pounds shall be independently supported by not less than 4 taut No. 12 gauge wires capable of supporting four times the load. For intermediate duty grid systems, fixtures shall be independently supported by not less than four taut No. 12 gauge wires capable of supporting four times the load. All fixture hanger wire ends shall be twisted three tight turns within a 2" distance. Fixture installation shall be coordinated with the acoustical ceiling installation.
- G. Light Pole Installation:
1. Set in concrete footings; set poles plumb and straight. Grout and drypack after leveling poles. Concrete, grout and drypack are specified under Section 03 30 00, Cast-in-Place Concrete.
 2. Electrically ground the fixtures and poles.
 3. Solder and tape splices as required for the floodlight fixture installations.
 4. Each standard shall be tapered galvanized steel, with handhole, anchor bolts, fixture mounting brackets and all accessories.
 5. Poles shall be designed to withstand a minimum wind velocity of 80 mph sustained, 104 mph gusts.
- H. Provide factory commissioning for lighting controls and devices. The completed installation shall comply in every way with the requirements of Title 24.

3.02 CLEANING

- A. Clean surfaces of all dirt, cement, plaster and other debris. Use cleansers compatible with material surfaces being cleaned.
- B. Clean lenses, reflectors, and the like of dust, fingerprints, and grime.

3.03 TESTING

- A. Check and adjust fixtures for even illumination.
- B. Replace defective fixtures and fixture components with new.
- C. The lighting control system shall be acceptance tested by a Title 24 Certified Commissioning Agent. The contractor is responsible for passing the acceptance tests.

END OF SECTION

SECTION 27 20 00
DATA COMMUNICATIONS

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 26
- B. All LAN Data system equipment and cabling shall be approved by the Owner prior to purchase and prior to installation. The following specifications are provided to establish a standard of quality. Actual numbers and manufactures may vary. Verify with Owner.

1.02 REFERENCES

- A. American National Standards Institute / Telecommunications Industry Association / Electrical Industries Association
 - 1. ANSI/TIA/EIA-568-B.1 and addenda
"Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements"
 - 2. ANSI/TIA/EIA-568-B.2 and addenda
"Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair"
 - 3. ANSI/TIA/EIA-568-B.3 and addenda
"Commercial Building Telecommunications Cabling Standard - Part 3: Optical Fiber Cabling and Components Standard"
 - 4. ANSI/TIA/EIA-569-B and addenda
"Commercial Building Standard for Telecommunications Pathways and Spaces"
 - 5. ANSI/TIA/EIA-606-A and addenda
"Administration Standard for the Telecommunications Infrastructure of Commercial Buildings"
 - 6. ANSI-J-STD-607-A and addenda
"Commercial Building Grounding and Bonding Requirements for Telecommunications"
 - 7. ANSI/TIA/EIA-526-7
"Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant"
 - 8. ANSI/TIA/EIA-526-14A
"Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant"
- B. International Electrotechnical Commission
 - 1. IEC/TR3 61000-5-2 - Ed. 1.0 and amendments
"Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines - Section 2: Earthing and cabling"
- C. International Organization for Standards

1. ISO/IEC 11801:2002 Ed2.0 and amendments
" Information technology - Generic cabling for customer premises"
- D European Committee for Electrotechnical Standardization
 1. CENELEC EN 50173:2000 and amendments
" Information Technology - Generic cabling systems"

1.03 SCOPE OF WORK

- A. Furnish all labor, programming, equipment, and materials for, and comply with the performance requirements of the Data/Communications System indicated in the drawings and specified herein.

1.04 SYSTEM DESCRIPTION

- A. A complete local area network to include outlets, plates, racks, optical fiber cable, copper cable distribution, cable management, etc. as required for the installation of a Local Area Network (LAN).

1.05 QUALITY ASSURANCE

- A. Required Contractor Training

The Contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to data, voice and imaging network systems. The Contractor shall at a minimum possess the following qualifications:

1. Provide references of the type of installation provided in this specification.
2. Personnel trained and certified in fiber optic cabling, splicing, termination and testing techniques. Personnel must have experience using an optical light source and power meter plus OTDR.
3. Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.
4. Contractor must be registered with BICSI and have at least one RCDD on staff;

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Ortronics/Legrand
123 Eugene O'Neill Drive, New London, CT 06320
Phone (800) 934-5432. Website: www.ortronics.com
- B. Berk-Tek
132 White Oak Road, New Holland, PA 17557
Phone (800) BERKTEK. Website: www.berktek.com
- C. American Power Conversion Corp
123 Fairgrounds Road, West Kingston, RI 02892
Phone (877) 272-2722. Website: www.apc.com

- D. Chatsworth Products, Inc.
31425 Agoura Road, Westlake Village, CA 91361
Phone (818) 735-6100. Website: www.chatsworth.com

2.02 BALANCED TWISTED-PAIR PRODUCTS

- A. In addition to meeting the category 6 specifications outlined in ANSI/TIA/EIA-568-B.2-1, the requirements of this section must also be met for the specified products.
- B. Outlets: Ortronics NetClear GT2 or equal
- C. Patch cords: Ortronics Clarity 6, Blue, 4-Pair or equal
- D. Category 6 Patch panels: Ortronics NetClear GT2 or equal
- E. Cable: Berk-Tek LANmark-1000 Category 6 Cable or equal

2.03 OPTICAL FIBER PRODUCTS

- A. In addition to meeting the specifications outlined in ANSI/TIA/EIA-568-B.3 and ISO/IEC 11801:2000 Ed2.0, the requirements of this section must also be met for the specified products.
- B. Outlets / Adapters / Connectors: Ortronics NetClear MM10 or equal
- C. Patch Cords: Ortronics 50/125µm laser optimized multimode duplex fiber or equal
- D. Patch Panels: Ortronics Low Profile, Rack Mount Fiber Cabinet or equal
- E. Cable: Berk-Tek Gigalite-10 multi-mode optical fiber cable
 - 1. Outdoor: Adventum loose tube-dry fiber
 - 2. Indoor: Horizontal Interconnect tight buffer fiber

2.04 MAIN DISTRIBUTION FRAME (MDF): DATA ROOMS

- A. Rack System:
 - 1. (2) 45U 2-post racks, Chatsworth Products, Inc. #48353-703 45U
 - 2. Vertical Cable Managers, Panduit #WMPVHC45E
 - 3. Horizontal Cable Managers, Panduit #WMP1E
 - 4. Bolt-down kits
 - 5. Power distribution and cordsets
 - 6. Seismic bracing
- B. UPS:
 - 1. American Power Conversion Corp. (APC)
 - 2. Rack-mounted uninterruptable power supply.

3. Provide 30 minute battery runtime for all rack-mounted equipment to include, data & VoIP switches, servers, surveillance DVR, etc. Coordinate with other specification sections and City IT personnel to determine minimum power rating and battery capacity.
- D. Include Factory Startup, Assembly Service, Software Support, Configuration, etc. for APC equipment.

2.05 SWITCHES

- A. HP ProCurve(verify)
 1. 10/100/1000 Power-over-Ethernet (PoE) rack mount switches.
 2. Provide adequate quantity of switches to accommodate all data outlets shown on plans.
 3. Switches shall have at least two ports that accept mini-GBIC's.
 4. Provide mini-GBIC's as required for Interbuilding connection with NOC.

2.06 GROUND BUS

- A. Panduit #GB4A0606I

2.07 CABLE TRAY

- A. B-LINE #SB13AL12FB

PART 3 - EXECUTION

3.01 SYSTEM DESIGN REQUIREMENTS

- A. Horizontal Cabling

The Horizontal Subsystem is the portion of the telecommunications cabling system that extends from the work area telecommunications outlet/connector to the horizontal cross-connect in the telecommunications room. It consists of the telecommunications outlet/connector, the horizontal cables, optional consolidation point, and that portion of the cross-connect in the telecommunications room serving the horizontal cable. Each floor of a building should be served by its own Horizontal Subsystem.

- B. Backbone Cabling

Cables allowed for use in the backbone include: 50/125µm multimode optical fiber cables. The cable shall support voice, data and imaging applications. The bending radius and pulling strength requirements of all backbone cables shall be observed during handling and installation.

1. Interbuilding Cabling

When a distribution system encompasses more than one building, the components that provide the link between buildings constitute the Interbuilding Backbone Subsystem. This subsystem includes the backbone transmission media, associated connecting hardware terminating this media, and

electrical protection devices to mitigate harmful voltages when the media is exposed to lightning and/or high voltage power surges that pass through the building cable. It is normally a first-level backbone cable beginning at the main cross-connect in the equipment room of the hub building and extending to the intermediate cross-connect in the equipment room of a satellite building.

3.02 SITE SURVEY

- A. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. The arrangements to remove any obstructions with the Project Manager need to be determined at that time.

3.03 PHYSICAL INSTALLATION

- A. Cable Pathways
 1. Pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations.
 2. Grounding / Earthing and bonding of pathways shall comply with applicable codes and regulations.
 3. Pathways shall not have exposed sharp edges that may come into contact with telecommunications cables.
 4. The number of cables placed in a pathway shall not exceed manufacture specifications, nor, will the geometric shape of a cable be affected.
 5. Pathways shall not be located in elevator shafts.
- B. Interbuilding Cable Routing
 1. Install an interbuilding connection from the MDF at this building to the MDF at the City Operations Building with 12 MM / 6 SM fiber optic cable. The connection shall be made via underground conduits.
 2. Unless otherwise recommended by the manufacturer, all fiber cables will be run in innerduct.
 3. Fibers will be terminated in the telecommunications rooms using SC, ST, MT-RJ or LC connectors in wall mounted interconnect centers or rack mounted panels equipped with sufficient ports, slack storage space and splice trays if required to terminate and secure all fibers.
 4. In an underground system, adequate underground conduit space shall be available and accessible at each building. The conduits shall not exceed a fill factor of 40%.
 5. All underground systems shall be designed to prevent water runoff from entering the building.
 6. The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each satellite building telecommunications room. All Interbuilding cables shall be installed to the applicable codes and regulations.
 7. Backbone pathways shall be installed such that the minimum bend radius and pulling tension of backbone cables is kept within cable manufacturer specifications both during and after installation.
 8. Lay detectable warning tape in all underground pathways.

- a. Warning tape shall be a minimum of 6" wide, orange in color, and shall have a non-degradable imprint as follows: "Caution Fiber Optic Cable Buried Below".
- b. The warning tape shall be detectable.

C. Horizontal Cable Routing

- 1. All horizontal cables, regardless of media type, shall not exceed 90 m (295 ft) from the telecommunications outlets in the work area to the horizontal cross connect.
- 2. The combined length of jumpers, or patch cords and equipment cables in the telecommunications room and the work area should not exceed 10m (33 ft) unless used in conjunction with a multi-user telecommunications outlet.
- 3. Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation.
- 4. In open ceiling cabling, cable supports shall be provided by means that is structurally independent of the suspended ceiling, its framework, or supports. These supports shall be spaced no more than 1.5 m (5 ft) apart.
- 5. Telecommunications pathways, spaces and metallic cables, which run parallel with electric power or lighting, which is less than 3kVA, shall be installed with a minimum clearance of 50 mm (2 in).
- 6. 4-pair balanced twisted-pair cables shall be run using a star topology from the telecommunications room serving that area to every individual information outlet. The customer prior to installation of the cabling shall approve all cable routes.
- 7. The Contractor shall observe the bending radius and pulling strength requirements of the 4-pair balanced twisted-pair and fiber optic cable during handling and installation.
- 8. Each run of balanced twisted-pair cable between horizontal portion of the cross-connect in the telecommunication closet and the information outlet shall not contain splices.
- 9. In a false ceiling environment, a minimum of 75 mm (3 in) shall be observed between the cable supports and the false ceiling.
- 10. Continuous conduit runs installed by the contractor should not exceed 30.5 m (100 ft) or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.
- 11. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.
- 12. The number of horizontal cables placed in a cable support or pathway shall be limited to a number of cables that will not cause a geometric shape of the cables.
- 13. Maximum conduit pathway capacity shall not exceed a 40% fill. However, perimeter and furniture fill is limited to 60% fill for move and changes.
- 14. Horizontal distribution cables shall not be exposed in the work area or other locations with public access.

D. Cable Administration

1. Identify cables at each end with a permanent self-laminating adhesive label.
2. All labels must be mechanically printed, and not written by hand. This requirement is intended to improve legibility and to upgrade the professional appearance of the installation.
3. The administrative schema shall be the 'Origination' and 'Destination' method for all cables.
4. It shall conform to the TIA/EIA 606-A Administration Standard for Commercial Telecommunications Infrastructure guidelines.
5. Identify each patch panel, workstation connector port, and copper patch panel port with a self-adhesive, machine printed label.
6. Each workstation connector port and patch panel port shall be identified with a unique cable identifier consisting of the building number with room number, station number, and then connector position (e.g. A.101:01:D1).
7. The station numbering plan is orientated to the building floor plans. Beginning from the room entrance in a clockwise manner, identify the first station as 01, then continue around the room, reserving the floor outlets, if any, as the last stations.
8. All fiber storage rings shall be clearly identified with a Fiber Optic Cable Marker label. The label shall display the Telecom Room Cross-connect number (e.g. TR-B1.1), as well as the fiber type and strand count.

E. Work Area Termination

1. All balanced twisted-pair cables wired to the telecommunications outlet/connector, shall have 4-pairs terminated in eight-position modular outlets in the work area. All pairs shall be terminated.
2. The telecommunications outlet/connector shall be securely mounted at planned locations.
3. The height of the telecommunications faceplates shall be to applicable codes and regulations.

F. Pulling Tension

1. The maximum cable pulling tensions shall not exceed manufacturer's specifications.

G. Bend Radius

1. The maximum cable bend radii shall not exceed manufacturer's specifications.
2. In spaces with balanced twisted-pair cable terminations, the maximum bend radius for 4-pair cable shall not exceed four times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.
3. During the actual installation, bend radius on 4-pair cable shall not exceed eight times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.

H. Slack

1. In the work area, a minimum of 300 mm (12 in) should be left for balanced twisted-pair cables, while 1 m (3 ft) be left for fiber cables.
2. In telecommunications rooms a minimum of 3m (10 ft) of slack should be left for all cable types. This slack must be neatly managed on trays or other support types.

I. Cable Tie Wraps

1. Tie wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points. These wraps shall not be over tightened to the point of deforming or crimping the cable sheath.
2. Hook and loop cable managers should be used in the closet where reconfiguration of cables and terminations may be frequent.

J. Grounding

1. All grounding / earthing and bonding shall be done to applicable codes and regulations.

K. Pull Ropes

1. Install a pull rope in with all cable pulls and in spare conduit.
2. Pull ropes shall be 1/2" flat tape with a minimum tensile strength of 1200 lbs.
3. Ropes shall be pre-lubricated woven polyester or aramid fiber tape made from low friction, high abrasion resistant yams providing a low coefficient of friction. Tape shall be printed with sequential footage markings for accurate measurement.

3.04 TESTING

- A. Testing of all newly installed cable channels shall be performed prior to system cutover.

B. Copper Testing

1. All category 6 field-testing shall be performed with an approved level III balanced twisted-pair field test device.
2. All installed category 6 channels shall perform equal to or better than the minimum requirements as specified by the table below:

Parameter	Performance @ 100MHz	Performance @ 200MHz	Performance @ 250MHz
Insertion Loss	20.3 dB	29.7 dB	33.7 dB
NEXT Loss	42.1 dB	37.5 dB	36.1 dB
PS NEXT Loss	40.6 dB	36.1 dB	34.6 dB
ACR	21.8 dB	7.8 dB	2.4 dB
PS ACR	20.3 dB	6.4 dB	0.9 dB
ACR-F	23.9 dB	17.9 dB	15.9 dB
PS ACR-F	20.9 dB	14.9 dB	12.9 dB

Return Loss	14.0 dB	11.0 dB	10.0 dB
Propagation Delay	528 ns	527 ns	526 ns
Delay Skew	40 ns	40 ns	40 ns

3. Category 6 balanced twisted-pair horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the basic link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-B.1. Test parameters include wire map plus ScTP shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return loss, insertion loss, propagation delay, and delay skew.

C. Fiber Optic Testing

1. Horizontal Fiber Testing

- a. Fiber horizontal cables shall be 100% tested for insertion loss and length.
- b. Insertion loss shall be tested at 850 nm or 1300 nm for 50/125µm multimode cabling in at least one direction using the Method B (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-14A.
- c. Length shall be tested using an OTDR, optical length test measurement device or sequential cable measurement markings.

2. Backbone Fiber Testing

- a. Fiber horizontal cables shall be 100% tested for insertion loss and length.
- b. Insertion loss shall be tested at 850 nm and 1300 nm for 50/125µm multimode cabling in at least one direction using the Method B (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-14A.
- c. Length shall be tested using an OTDR, optical length test measurement device or sequential cable measurement markings.

D. Test Equipment Criteria

1. All balanced twisted-pair field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.
2. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters
3. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

3.05 ADMINISTRATION & DOCUMENTATION

A. Drawings

1. As-built drawings shall be supplied by the contractor showing the locations of and identifiers for all:
 - a. Horizontal cable routing and terminations
 - b. Telecommunications outlets/connectors
 - c. Backbone cable routing and terminations

B. Records and reports

1. All records shall be created by the installation contractor and turned over at the completion of work. The format shall be computer based and both soft copies and hard copies shall be part of the As-built package. The minimum requirements include:
 - a. Cable records must contain the identifier, cable type, termination positions at both ends, splice information as well as any damaged pairs/conductors.
 - b. Connecting hardware and connecting hardware position records must contain the identifier, type, damaged position numbers, and references to the cable identifier attached to it.
 - c. Test documentation on all cable types shall be included as part of the As-built package.
2. All reports shall be generated from the computer-based program used to create the records above. These reports should include but not limited to:
 - a. Cable Reports
 - b. Cross-connect Reports
 - c. Connecting Hardware Reports

3.06 WARRANTY

- A. Either a basic link or channel model configuration may be applied to the horizontal and/or backbone sub-systems of the structured cabling system. Applications assurance is only applied to a channel model configuration. All channels are to be qualified for linear transmission performance up to 250 MHz to ensure that high-frequency voltage phase and magnitude contributions do not prove cumulative or adversely affect channel performance.

B. System Warranty

A twenty (25) year warranty available for the category 6 structured cabling system shall be provided for an end-to-end channel model installation which covers applications assurance, cable, connecting hardware and the labor cost for the repair or replacement thereof. Additional features of the warranty shall include:

1. Margin over category 6 channel specifications on all parameters across the entire frequency range of 1-250MHz as noted below:

Parameter	Guaranteed Margin
-----------	-------------------

	1-250MHz
Insertion Loss	0.1 dB
NEXT Loss	0.9 dB
PS NEXT Loss	1.9 dB
ACR	1.1 dB
PS ACR	2.1 dB
ACR-F	0.6 dB
PS ACR-F	0.6 dB
Return Loss	0.5 dB
Propagation Delay	20 ns
Delay Skew	10 ns

2. Performance claims based on worst case testing and channel configurations

- C. Product Warranty
The manufacturer of passive telecommunications equipment used in a manner not associated with the Systems Warranty must have a minimum five (5) year Component Warranty on all its products. The Products Warranty covers the components against defects in material or workmanship under normal and proper use.

END OF SECTION

SECTION 28 31 00
FIRE ALARM AND DETECTION

PART 1: GENERAL

1.01 GENERAL

- A. Furnish as described and hereinafter specified, a complete and operating area coverage fire alarm system, including: Initiating devices; alarm appliances; power supplies; zone modules and relays; expansion panels; batteries, complete SFM listed components; etc., fully operational, and City of Clovis Fire Prevention completion certification. The intent of these specifications is to provide a complete and satisfactory operating system. As only a complete operable master will be acceptable, all equipment required for this function, whether or not enumerated herein, shall be supplied as part of this bid. Provide all required submission and approval with City of Clovis Fire Prevention.
- B. Fire Alarm master panel shall be U.L. listed.
- C. All equipment to be supplied under this section shall be 100% solid state in design.
- D. The entire system shall be manufactured and assembled by the authorized manufacturer. It shall be received complete to the Owner with the proper factory installed U.L. labels on the equipment. The supplier shall maintain a fully equipped service organization, stocking the manufacturer's standard parts and capable of furnishing, in the sole judgement of the district, adequate inspections and service to the system. All equipment shall be supplied by a registered and certified factory trained vendor.
- E. The contractor shall, upon request, provide certification to this effect.

1.02 OPERATION

- A. When an alarm occurs, the control panel indicates the alarm condition until manually reset.

An alarm may be acknowledged by pressing the "ALARM ACKNOWLEDGE" switch. This shall silence the panel sounder, and change the "ALARM" LED from flashing to steadily lit.

All notification appliances may be silenced by operating the "SIGNAL SILENCE" switch. This shall steadily light the "SYSTEM SILENCED" LED. If a subsequent alarm is activated, the notification appliances shall "resound" until again silenced. Once silenced, all notification appliances may be restored again by operating the "SIGNAL SILENCE" switch. Waterflow zones shall be non-silenceable.

- B. ALARM VERIFICATION

Smoke detector alarm verification shall be a standard option on all zones while allowing any dry contact device (i.e.: manual stations, heat detectors, etc.) to create an immediate alarm. This feature shall allow smoke sensors that are installed in environments prone to nuisance or unwanted alarms to operate per the following sequence:

- ☐ System Ready - prior to smoke sensor alarm.
- ☐ Smoke Sensor Alarm - @ time = 0.
Prealarm Window - 15 seconds; a distinctive pre-alarm indication shall be displayed.
- ☐ Zone Reset - 5 seconds (occurs at end of pre-alarm window).
Alarm Verification Window - 90 seconds; the system shall respond to a second alarm from the same smoke sensor as a system alarm.

1. System Ready - no alarm verification.

NOTE: The verification sequence is suspended once a system alarm is activated.

C. ALARM SIGNALS

All alarm signals shall be automatically latched or "locked in" at the control panel until the operated device is returned to normal and the control panel is manually reset. The alarm signals shall be programmable for "non-latching" operation when required by the Authority Having Jurisdiction. When used for waterflow, the "SIGNAL SILENCE" switch shall be bypassed.

D. ELECTRICALLY SUPERVISED

Each signaling line circuit and notification appliance circuit shall be electrically supervised for opens, shorts and ground faults.

The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any circuit that does not have a fault condition.

A yellow "SYSTEM TROUBLE" LED shall light and the system audible sounder shall steadily sound when any trouble is detected in the system. Failure of power, opens or short circuits on the notification appliance or signaling line circuits, disarrangement in system wiring, failure of the microprocessor or any identification module, or system ground faults shall activate this trouble circuit.

A trouble signal may be acknowledged by operating the "ALARM ACKNOWLEDGE" switch. This shall silence the sounder. If subsequent trouble conditions occur, the trouble circuitry will resound.

During an alarm, all trouble signals shall be suppressed with the exception of lighting the yellow "SYSTEM TROUBLE" LED.

F. DRIFT COMPENSATION - ANALOG SMOKE SENSORS

System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to the effects of component aging or environment (i.e.: dust). Each sensor shall maintain its actual sensitivity under adverse conditions to respond to actual alarm conditions while ignoring the factors that generally contribute to nuisance alarms.

The system trouble circuitry shall activate, display "DIRTY DETECTOR" and "VERY DIRTY DETECTOR" indications and identify the individual unit that has been compensated beyond its acceptable limits.

G. ANALOG SMOKE SENSOR TEST

System software shall automatically test each analog smoke sensor a minimum of three times daily. The test shall be a recognized functional test of each ionization chamber (analog ionization sensors) and photocell (analog photoelectronic sensors) as required annually by NFPA 72. Failure of a sensor shall activate the system trouble circuitry, display a "Test Failed" indication, and identify the individual unit.

H. DUAL - MODE WALK TEST

The control unit shall provide a Dual-Mode Zoned Walk Test Program that shall enable an individual to test the Alarm/Supervision status of each sensor or module connected to the system. During walk test, the control unit shall automatically reset after an alarm condition enabling the technician to continue testing the system without requiring a return to the control panel.

During an Audible walk test, placing a device in alarm will cause four pulses on the notification appliance circuits. Operation of a supervisory switch will cause three pulses, while removal or disconnection of an initiating device will cause two pulses. All tests should be recorded by a printer for reference.

A Silent walk test will record all tests by a printer for reference while not activating the notification appliance circuit(s).

I. PRINTED CIRCUIT BOARDS, CONTROL PANEL COMPONENTS

The control unit shall be contained in a steel cabinet.

All groups of circuits or common equipment shall be clearly marked. The control unit shall be red in color and shall include the following features:

Auxiliary SPDT alarm and trouble dry contacts.

1. A solid-state power transfer circuit that shall switch to standby power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions). This circuit shall allow the batteries to be effectively "floated" on the operating system to avoid upsetting normal microprocessor operation and minimize resultant nuisance troubles and/or alarms. This circuit shall be physically isolated from the power supply to facilitate service.

- 2 Ground fault detector to detect positive or negative grounds on the signaling line circuits, notification appliance circuits and power circuits. A ground fault indication shall occur on the display and the general trouble devices shall operate as specified herein but shall not cause an alarm.
- 3 Lightning protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits and notification appliance circuits. Systems that require an optional module to provide this protection shall not be considered equal.
4. Individual overcurrent protection shall be provided for the following: smoke detector (resettable) power, main power supply, battery standby power, and auxiliary (non-resettable) output.
5. A common reset and lamp test switch, labeled "SYSTEM RESET/LAMP TEST" shall be provided on panel.

PART 2: EQUIPMENT

2.01 EQUIPMENT:

- A. Contractor shall provide complete system design and obtain approval from the City of Clovis.
- B. The new system shall be EST 3, Gamewell/FCI E3, or approved equal.

PART 3: EXECUTION

3.01 CODES AND STANDARDS:

- A. All equipment, devices, cables, etc. shall be listed by Underwriters Laboratories, Inc., and/or approved by Factory Mutual for the purpose of fire alarm systems.
- B. The System shall comply with all local and state codes with no exceptions.
- C. The System shall comply with the applicable provisions of the California Fire Code and current NFPA Standards: 72
- D. All equipment shall be State of California Fire Marshal listed.

3.02 WIRING:

- A. The installer shall coordinate the installation of the Fire Alarm equipment with the manufacturer or his authorized distributor. All conductors and wiring shall be installed per the manufacturers recommendations. It shall be the installers responsibility to coordinate with the supplier the correct wiring procedures prior to installing any conduits or conductors.

- B. System components shall be installed in accordance with the latest revisions of the appropriate NFPA pamphlets, the requirements contained herein, California Electrical Code and state regulations. Pigtail connections between circuit wires and detector terminals are not acceptable. Devices shall be connected directly to the circuit line wires. Inside wiring refers to the appropriate NFPA standard for acceptable wiring and installation requirements. All wire used on the fire alarm system shall have a minimum insulation rating of 105 Centigrade. Low energy UL listed fire protective signaling circuit cable with 105 degree insulation may be used when allowed by the local authority having jurisdiction.

3.03 SHOP DRAWINGS

Shop drawings for fire alarm systems shall be submitted for review and approval prior to system installation, and shall include, but not be limited to, all of the following where applicable to the system being installed:

1. A floor plan that indicates the use of all rooms.
2. Locations of alarm-initiating devices.
3. Locations of alarm notification appliances, including candela ratings for visible alarm notification appliances.
4. Design minimum audibility level for occupant notification.
5. Location of fire alarm control unit, transponders and notification power supplies.
6. Annunciators.
7. Power connection.
8. Battery calculations.
9. Conductor type and sizes.
10. Voltage drop calculations.
11. Manufacturers' data sheets indicating model numbers and listing information for equipment, devices and materials.
12. Details of ceiling height and construction.
13. The interface of fire safety control functions.
14. Classification of the supervising station.
15. All plans and shop drawings shall use the symbols identified in NFPA 170, Standard for Fire Safety and Emergency Symbols.

END OF SECTION

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 Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
2. City of Clovis Standard Specifications Sections 15 and 16.
3. Soils Report: Recommendations as outlined in the Soils Report Project No. 012-15087 by Krazan & Associates, Inc. dated October 22, 2015, shall become requirements for this development.

1.3 DEFINITIONS

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "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; the zone where plant roots grow.
- D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated according to requirements in Section 015639 "Temporary Tree and Plant Protection."

- E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference as required by the City of Clovis.

1.5 MATERIAL OWNERSHIP

- A. Except for 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 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: 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.
 - 1. Use sufficiently detailed photographs or video recordings.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.
- C. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 FIELD 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 trafficways 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 City of Clovis.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises at the City of Clovis Public Utilities Street Department
- D. Utility Locator Service: Notify U.S.A. (Underground Service Alert) for area where Project is located before site clearing at least forty-eight (48) hours prior to commencement of work.

- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.
- B. Antirust Coating or cut ends of steel reinforcement: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #23 (surface-tolerant, anticorrosive metal primer).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction. Utilize City of Clovis benchmark replacement procedures if necessary.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- C. 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 the City of Clovis not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without the City's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

- A. 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 larger than 1 inch in diameter, obstructions, and debris to a depth of 24 inches below exposed subgrade.
 - 3. Use only hand methods or air spade for grubbing within protection zones.
 - 4. Chip removed tree branches and dispose of off-site.
- B. 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 6 inches, and compact each layer as specified in the soils report.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil as indicated in the soils report in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects larger 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 or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction. This includes but is not limited to the following:
 1. Concrete Slabs & Foundations
 2. Concrete Walks & Decorative Concrete
 3. Concrete Curb & Gutter
 4. Concrete Valley Gutters
 5. Pavement (on-site areas, trail, alley, street)
 6. Fences (chain link & wood) and fence posts
 7. Sewer Lateral
 8. Restroom Plumbing
 9. Utility Poles
 10. All wet and dry utilities serving the demolished buildings.
 11. Inlets and any drainage system
 12. On-site sprinkler and irrigation system
 13. Hose Bib
 14. Bike Rack & Trash Can
 15. Pedestrian Barricade
 16. Signs
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 2. 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.

3.8 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 311000

SECTION 312000 - EARTH MOVING

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. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

- B. Related Requirements:

1. [Section 013200 "Construction Progress Documentation"] and [Section 013233 "Photographic Documentation"] for recording pre-excavation and earth-moving progress.
2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
3. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
4. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.
5. Soils Report: Recommendations as outlined in the Soils Report Project No. 012-15087 by Krazan & Associates, Inc. dated October 22, 2015, shall become requirements for this development.
6. City of Clovis Standard Specifications dated October 1, 2012 for work performed within the Public Right-of-Way and for the 8 inch water main loop through the site.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

- B. Aggregate Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Soils Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Soils Engineer. Unauthorized excavation, as well as remedial work directed by Soils Engineer, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below base, drainage fill, drainage course, or topsoil materials.
- J. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct pre-excavation conference as required by City of Clovis.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Controlled low-strength material, including design mixture.
 - 2. Warning tapes.
- B. Samples for Verification: For the following products, in sizes indicated below:
 - 1. Warning Tape: 12 inches long; of each color.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D2487.
 - 2. Laboratory compaction curve according to ASTM D1557.
- C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving 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 earth moving 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. Utility Locator Service: Notify U.S.A. (Underground Service Alert) for area where Project is located before beginning earth-moving operations.
- D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" are in place.
- E. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" 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.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: See Soils Report for full description of Engineered Fill requirements. All imported fill material shall be submitted to the Soils Engineer for approval at least 48 hours prior to delivery at the site. It should be predominately non-expansive granular material free of rock or and clods larger than 4 inches in diameter, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil that does not meet the satisfactory soils per the soils report.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Aggregate Base Course: As specified in Section 26, "Aggregate Bases", of the State Standard Specifications, Class 2 Aggregate Base; and per the requirements of the soils report.
- E. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; per the requirements of the soils report.
- F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; per the requirements of the soils report.
- G. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; per the requirements of the soils report.
- H. Sand: ASTM C33/C33M; fine aggregate.

2.2 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: 2-Sack Sand Cement Slurry

2.3 ACCESSORIES

- A. Locator Wire for marking and identifying underground utilities shall be per City of Clovis Standards & Specifications.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
- D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Debris Removal: Site debris (subsurface concrete, pavement, structures, etc.), if encountered during site development, shall be removed per the soils report.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance per . If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance per soils report. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades per approved plans.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations per approved plans and City of Clovis Standard ST-20.
 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 1. Clearance: per pipe manufacturer's recommendation
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of

pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

- A. Notify the City Inspector when excavations have reached required subgrade.
- B. If the City Inspector determines by recommendation of the Soils Engineer that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade per soils report.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Soils Engineer, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings as directed by soils engineer.
- B. Fill unauthorized excavations under other construction, pipe, or conduit as directed by soils engineer.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for Record Documents.
 3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring, bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Roadways:
 1. For the water main in the public Right-of-Way and the 8-inch water main loop on-site, where the pipe has less than 30 inches of cover from roadway surface, provide backfill as shown on plans.
- D. Backfill voids with satisfactory soil while removing shoring and bracing.
- E. Backfill:
 1. For the trenches for the water main in the public Right-of-Way, the 8-inch water main loop on-site and all utilities greater than 4" diameter, provide backfill per City of Clovis Standard ST-20.
 2. For all other trenches, backfill per the soils report recommendations.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 1. Under grass and planted areas, use satisfactory soil material.
 2. Under walks and pavements, use satisfactory soil material.

3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers per soils report recommendation.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D1557:
1. Under structures, building slabs, steps, and pavements, scarify and recompact subgrade and each layer of backfill per soils report.
 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent minimum. The following exceptions require increased compaction for vehicular loading.
 - a. The area North of the Rollup Door on the Senior Center Building up to the wedge curb, increase compaction to 95 percent minimum.
 - b. The AC Trail shall have 95 percent minimum compaction.
 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 4. For utility trenches, compact each layer of initial and intermediate backfill at 90 percent, and final backfill soil material at 95% percent.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus 1 inch, no minus.
 - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place base course under pavements and walks as follows:
 - 1. Place base course material over subgrade course under hot-mix asphalt pavement.
 - 2. Shape base course to required crown elevations and cross-slope grades.
 - 3. Place base course 6 inches or less in compacted thickness in a single layer.
 - 4. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 5. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D1557.
- C. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders, as shown on plan, of satisfactory soil materials and compact simultaneously with each base layer to not less than 95 percent of maximum dry unit weight according to ASTM D1557.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows as shown on plans.

3.19 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Re-testing Cost: Contractor shall be responsible for the cost of any and all re-testing.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Soils Engineer.
- E. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations as recommended by the soils engineer:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer.
 - 2. Foundation Wall Backfill: At each compacted backfill layer.
 - 3. Trench Backfill: At each compacted initial and final backfill layer.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Soils Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Soils Engineer.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

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 the following:
 - 1. Soil treatment with termiticide.
 - a. See Part 3 Article "AREA OF APPLICATION" for locations of application.

1.3 SUBMITTALS

- A. Product Data: For termiticide.
 - 1. Include the EPA-Registered Label for termiticide products.
- B. Product Certificates: For termite control products, signed by product manufacturer.
- C. Qualification Data: For Installer of termite control products.
- 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. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.
- E. Warranty: Special warranty specified in this Section.

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. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.

- C. Source Limitations: Obtain termite control products through one source from a single manufacturer for each product.
- D. 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 PROJECT 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.

1.6 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 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 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.
 - 1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation 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. 5' beyond the outside dimensions of building perimeter and footings.

3.4 APPLICATION, GENERAL

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.5 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
 - 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: Adjacent soil including soil 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.

3.6 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.
- 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.

END OF SECTION

SECTION 321216 - ASPHALT PAVING

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. Hot-mix asphalt paving.
2. Hot-mix asphalt patching.
3. Asphalt curbs.
4. Asphalt surface treatments.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for demolition and removal of existing asphalt pavement.
2. Section 312000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
3. Section 321313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.
4. Section 321373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.
5. Soils Report: Recommendations as outlined in the Soils Report Project No. 012-15087 by Krazan & Associates, Inc. dated October 22, 2015, shall become requirements for this development.
6. City of Clovis Standard Specifications Sections 37, 39 & 92.
7. State Standard Specifications Sections 37, 39 & 92.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference as required by the City of Clovis.

1.4 ACTION SUBMITTALS

A. Hot-Mix Asphalt Designs:

1. For each hot-mix asphalt design proposed for the Work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For paving-mix manufacturer and testing agency.
- B. Material Certificates: Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.
 - 1. Aggregates.
 - 2. Asphalt binder.
 - 3. Asphalt cement.
 - 4. Cutback prime coat.
 - 5. Emulsified asphalt prime coat.
 - 6. Tack coat.
 - 7. Fog seal.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Standard Specifications of the City of Clovis and Section 39 of the State Standard Specifications for asphalt paving work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the minimum temperature as stated in the soils report recommendation is not satisfied.

PART 2 - PRODUCTS

2.1 ASPHALTIC CONCRETE SURFACING

- A. Shall be of the performance grade, type, and size as required in the soils report and shall conform to the requirements of Section 39 of the State Standard Specifications.
- B. Tack Coat: Per State Standard Specification Section 39.
- C. Fog Seal: Per the soils report recommendation and State Standard Specification Section 37.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition, firm and unyielding, to begin paving.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.
- B. Proof-roll subgrade below pavements per soils report to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade per soils report recommendations.
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Soils Engineer, and replace with compacted backfill or fill as directed.

3.3 SURFACE PREPARATION

- A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.
- B. Ensure that Aggregate Base course has been installed per City of Clovis Standard Specifications Section 26.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement and concrete surfaces that are being paved to.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 HOT-MIX ASPHALT

- A. Hot-Mix Asphalt shall be installed per Caltrans Placement Method per State Standard Specifications Section 39.
- B. Repairs shall Utilize City of Clovis infrared Asphalt Concrete Repair Specification.

3.5 ASPHALT CURBS

- A. Construct hot-mix asphalt curbs per City of Clovis Standard Specification Section 39.

3.6 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch.
 - 2. Surface Course: 1/8 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.
- B. Slurry Seals: Apply slurry coat in a uniform thickness in accordance with ASTM D3910 and allow to cure.
 - 1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Utilize a City of Clovis contracted testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with City of Clovis Standard Specification for verification of thickness method.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement in accordance with California Test 375.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared in accordance with State Standard Specifications Section 39, and compacted in accordance with job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples with method and frequency in accordance with State Standard Specifications Section 39.
- E. Replace and compact hot-mix asphalt where core tests were taken.

- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.9 WASTE HANDLING

- A. General: Handle asphalt-paving waste in accordance with approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING AND MISCELLANEOUS 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 Concrete including the Following:

1. Driveways.
2. Parking lots.
3. Curbs and gutters.
4. Walks.

- B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
3. Section 321713 "Parking Bumpers."
4. Section 321723 "Pavement Markings."
5. Section 321726 "Tactile Warning Surfacing" for detectable warnings
6. City of Clovis Standard Specifications Sections 40 and 73
7. State Standard Specifications Section 40

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference as required by the City of Clovis.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
- C. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.
- B. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Applied finish materials.
 - 6. Bonding agent or epoxy adhesive.
 - 7. Joint fillers.
- C. Material Test Reports: For each of the following:
 - 1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- D. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
- B. Testing Agency Qualifications: Testing Agency contracted through the City of Clovis
- C. 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 mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
 - 2. Build mockups of concrete in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 60 inches by 60 inches Include full-size detectable warning.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a City of Clovis contracted testing agency to perform preconstruction testing on concrete paving mixtures.

1.9 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 - 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
- C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A, plain steel.
- D. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.
- E. Steel Bar Mats: ASTM A184/A184M; with ASTM A615/A615M, Grade 60 deformed bars; assembled with clips.
- F. Deformed-Steel Wire: ASTM A1064/A1064M.
- G. Joint Dowel Bars: ASTM A615/A615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.

- H. Epoxy-Coated, Joint Dowel Bars: ASTM A775/A775M; with ASTM A615/A615M, Grade 60 plain-steel bars.
- I. Tie Bars: ASTM A615/A615M, Grade 60; deformed.
- J. Hook Bolts: ASTM A307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- K. Provide dobies for concrete flat work with reinforcement in sufficient quantity to ensure that the reinforcement is maintained at the correct height within the concrete.
- L. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- M. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.
- N. Zinc Repair Material: ASTM A780/A780M.

2.4 CONCRETE MATERIALS

- A. Concrete shall be Portland cement concrete (PCC) conforming to the City Standard Specifications Section 73 "Concrete Curbs, Sidewalks, Surface Improvements" and all associated City Standard Drawings for the concrete surface improvements as shown on the Construction Drawings and these Provisions herein. Class 1, 2 or 3 PCC shall be used for various applications as specified in the Contract and shall conform to the Caltrans Standard Specifications Section 90.
- B. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
 - 1. Color: As selected by Architect.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- C. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
- E. White, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 2, Class B, dissipating.

2.6 RELATED MATERIALS

- A. Joint Fillers: As specified on plans and City Standards in preformed strips.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy-Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
 - 1. Types I and II, non-load bearing; Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
- F. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of Portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
 - 1. Color: As selected by Architect.
- G. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
 - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.
- B. Portland cement concrete (PCC) shall contain not less than 470 pounds of portland cement content for a 5-sack concrete mix design, based on the industrial standard of 94 pounds per sack. If

mineral admixtures such as coal fly ash are used, PCC shall conform to the Caltrans Standard Specifications Section 90 "Portland Cement Concrete". Class 3 concrete shall contain not less than 505 pounds of cementitious material per cubic yard in accordance with the Caltrans Standard Specifications Subsection 90-1.01 "Description". The use of mineral admixtures shall conform to the Subsection 90-4.08 and the use of chemical admixtures shall conform to the Subsection 90-4.05.

C. Cementitious Materials:

1. Fly Ash or Pozzolan: 15 percent max.
2. Slag Cement: 50 percent.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

E. Color Pigment: Color to be integrated into concrete mixture, not surface applied, according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

F. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): Strength according to designated use.
2. Maximum W/C Ratio at Point of Placement: As required.
3. Slump Limit: As required for specific use.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Furnish batch certificates for each batch discharged and used in the Work.

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: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving per soils report to identify soft pockets and areas of excess yielding.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D3963/D3963M.

- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

- A. General: Joints shall be per City of Clovis Standard Specifications. Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints, as required on plans. Construction joints shall be as shown on plans and shall have 15' max spacing, whichever is more frequent.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 45 feet unless otherwise indicated, per City Standard.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes.
 - a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/2-inch radius. Repeat tooling of edges after applying surface finishes.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
- K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture. Finish as per plan or standard plans.
 - 1. Per City of Clovis Standard Specifications use Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
 - 1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
 - 2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
 - 3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
 - 4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch (1.6 mm).
 - 1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
 - 2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
 - 3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
 - 4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.

2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
 3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
 4. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.
- D. Rock-Salt Finish: After initial floating, troweling, or brooming, uniformly spread rock salt over paving surface at the rate of 5 lb/100 sq. ft. (0.2 kg/10 sq. m).
1. Embed rock salt into plastic concrete with roller or magnesium float
 2. Cover paving surface with 1-mil- (0.025-mm-) thick polyethylene sheet and remove sheet when concrete has hardened and seven-day curing period has elapsed.
 3. After seven-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt, thereby leaving pits and holes.
- E. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:
1. Uniformly spread dry-shake hardener at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m) unless greater amount is recommended by manufacturer to match paving color required.
 2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.
 3. After final power floating, apply a hand-troweled finish followed by a broom finish.
 4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.9 DETECTABLE WARNING INSTALLATION

- A. Surface Applied Detectable Warnings: Install Surface Applied Detectable Warnings with adhesive and fastening hardware per manufacture's specifications and installation instructions to comply with Section 321726 "Tactile Warning Surfacing".

3.10 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to 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.

- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by one of the following methods, or as required by Plans and City Standards as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
 - 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.

3.11 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 - 1. Elevation: 3/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-feet-long; unleveled straightedge not to exceed 1/2 inch.
 - 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
 - 5. Lateral Alignment and Spacing of Dowels: 1 inch.
 - 6. Vertical Alignment of Dowels: 1/4 inch.
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
 - 8. Joint Spacing: 3 inches.
 - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 10. Joint Width: Plus 1/8 inch, no minus.

3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Utilize a City of Clovis contracted testing agency to perform tests and inspections.

- B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - 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.
- C. Prepare test and inspection reports.

3.13 REPAIR AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with Portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321713 - PARKING BUMPERS

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. Precast concrete wheel stops.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Precast concrete wheel stops.
- B. Samples for Initial Selection: For each type of exposed finish requiring color selection.

PART 2 - PRODUCTS

2.1 PARKING BUMPERS

- A. Precast Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete; 4000-psi minimum compressive strength; manufacturer's standard height and width, approximately 5 inches high by approximately 7 inches wide by 72 inches long. Provide chamfered corners and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.
 - 1. Source Limitations: Obtain wheel stops from single source from single manufacturer.
 - 2. Surface Appearance: Smooth, free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
 - 3. Surface Sealer: Manufacturer's standard salt-resistant, clear sealer, applied at precasting location.
 - 4. Mounting Hardware: hardware as standard with wheel-stop manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation in accordance with manufacturer's written instructions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wheel stops in accordance with manufacturer's written instructions unless otherwise indicated.
- B. Install wheel stops in bed of adhesive before anchoring to substrate.
- C. Securely anchor wheel stops to substrate with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 321713

SECTION 321723 - PAVEMENT MARKINGS

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. Painted markings applied to asphalt paving.
 - 2. Painted markings applied to concrete surfaces.

- B. Related Requirements:

- 1. Section 071800 "Traffic Coatings" for painting whole areas of building floors and pavements with coatings having an integral wearing surface.
 - 2. Section 099113 "Exterior Painting" for painting exterior concrete surfaces other than pavement markings.
 - 3. Section 099123 "Interior Painting" for painting interior concrete surfaces other than pavement markings.
 - 4. City of Clovis Standard Specifications dated October 1, 2012, Section 84

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference as required by the City of Clovis.

1.4 ACTION SUBMITTALS

- A. Product Data: Include technical data and tested physical and performance properties.

- 1. Pavement-marking paint, alkyd.
 - 2. Pavement-marking paint, solvent-borne.
 - 3. Pavement-marking paint, acrylic.
 - 4. Pavement-marking paint, latex.
 - 5. Thermoplastic, Alkyd Binder.
 - 6. Glass beads.

- B. Shop Drawings:

- 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.

2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Standard Specifications Section 84 of the City of Clovis for pavement-marking work.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at minimum and maximum temperatures per manufacture's requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain pavement-marking paints from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in 2019 California Building Code Chapter 11B.

2.3 PAVEMENT-MARKINGS

- A. Thermoplastic Markings: Alkyd Binder Thermoplastic conforming to Section 84-2.02 "Materials" of State Standard Specifications and the City of Clovis Standard Specifications Section 84.

1. Color: White
2. Thickness: 125 mils (+/- 15 mils)

- B. Paint:

1. Color: White and Blue, as indicated.
2. Waterborne Paint (rapid dry) shall comply with the following specifications per City of Clovis Standard Specifications, Section 84-2.2(A), see below:

Color	White
Pigment, % by weight +/-2%	60

Vehicle, % by weight	38-42
Total Solids, % by weight minimum	76
Viscosity, K.U. @ 77° F	78-92
Fineness of Grind, Hegman minimum	3.5
Dry time: 77° F without beads ASMT D-711, minutes maximum	10
Flexibility, 8 Mils wet, 24 hours are dry ½" Mandrel	No cracking
Contrast Ratio: 15 Mils wet, min.	0.98
Weight per gallon minimum	13.50
Reflectance, minimum	85
VOC gms/liter, maximum	150

C. Glass Beads: State Specification No. 8010-004 (Type II)

1. Roundness: Minimum 75 percent true spheres.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils
 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
 2. Broadcast glass beads uniformly into wet markings at a rate of 5 lbs/gal.

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

SECTION 321726 - TACTILE WARNING SURFACING

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. Surface-applied detectable warning tiles.
- B. Related Requirements:
 - 1. Section 321313 "Concrete Paving" for concrete walkways serving as substrates for tactile warning surfacing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For each type of exposed finish requiring color selection.
- C. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. 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 as required by the City of Clovis.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Adhesive Application:
 - 1. Apply adhesive only when ambient temperature satisfies manufacture's recommendations. Do not apply when substrate is wet or contains excess moisture.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering and wear.
 - b. Separation or delamination of materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

- A. Accessibility Requirements: Comply with applicable provisions in 2019 California Building Code (CBC) Chapter 11B for tactile warning surfaces.
 - 1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.
- B. Source Limitations: Obtain each type of tactile warning surfacing, joint material, setting material, anchor, and/or fastener from single source with resources to provide materials and products of consistent quality in appearance and physical properties.
- C. Warranty: Detectable warning tiles shall have a minimum of five (5) year product warranty.

2.2 DETECTABLE WARNING TILES

- A. Detectable warning device shall be a surface applied product only, ***No cast-in-place product shall be accepted.*** Detectable warning device shall include all adhesive, hardware and associated appurtenances in accordance with its manufacture specifications and installation instruction.
1. Products: Detectable warning device shall be one of the products listed below or approved equals by the City. Bidders may contact the manufacturers and visit the official web sites for more information.
 - a. Armor-Tile™ Surface Applied Tactile Systems by Engineered Plastics, Inc. <http://www.armor-tile.com>, (800) 682-2525
 - b. Access Tile® Surface Applied Tactile Systems by Access Products, Inc. <http://www.accessstile.com>, (888) 679-4022
 - c. Surface Applied Detectable Warning Systems by ADA Solutions, Inc. <http://www.adatile.com>, (800) 372-0519
 - d. Surface Mount / Retro Fit Panels by Armorcast Products Company <http://www.armorcastprod.com>, (818) 982-3600
 2. Color: Federal yellow.
 3. Shapes and Sizes:
 - a. Rectangular panel(s), to provide full coverage of the width of the ramps or walk as shown on plans and 3 foot minimum depth.
 - b. Radius panel, to match radius of curb return where applicable.
 4. Dome Spacing and Configuration: per plan detail or approved alternate, compliant with 2019 CBC requirements.
 5. Mounting as recommended by manufacturer.

2.3 ACCESSORIES

- A. As recommended by manufacturer:
1. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:
 - a. Furnish stainless-steel fasteners for exterior use.
 - b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.
 2. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.
 3. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF TACTILE WARNING SURFACING

- A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.
- B. Place tactile warning surfacing units in dimensions and orientation indicated on plans. Any deviation must be approved by architect.

3.3 INSTALLATION OF DETECTABLE WARNING TILES

- A. Surface-Applied Detectable Warning Tiles:
 - 1. Lay out detectable warning tiles as indicated and mark concrete pavement.
 - 2. Prepare existing paving surface by grinding and cleaning as recommended by manufacturer.
 - a. Cut perimeter kerf in existing concrete pavement to receive metal tile flange.
 - 3. Apply adhesive to back of tiles in amounts and pattern recommended by manufacturer, and set tiles in place. Firmly seat tiles in adhesive bed, eliminating air pockets and establishing full adhesion to pavement. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.
 - 4. Install anchor devices through face of tiles and into pavement using anchors located as recommended by manufacturer. Set heads of anchors flush with top surface of mat.
 - 5. Mask perimeter of tiles and adjacent concrete, and apply sealant in continuous bead around perimeter of tile installation.
 - 6. Remove masking, adhesive, excess sealant, and soil from exposed surfaces of detectable warning tiles and surrounding concrete pavement using cleaning agents recommended in writing by manufacturer.
 - 7. Protect installed tiles from traffic until adhesive has set.

3.4 CLEANING AND PROTECTION

- A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.

- B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION 321726

SECTION 328400 IRRIGATION SYSTEM

PART I - 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 Section.

1.2 SUMMARY

- A. Provide all materials, labor, equipment and services necessary to furnish and install 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 irrigation system is shown on the drawings. Point of Connection (P.O.C). and controller location are shown on the drawings.
- B. Related Work:

329300 PLANTS

1.3 CODES AND REGULATIONS

- A. All work and materials shall be in full accordance with the following codes adopted and amended by the authority having jurisdiction. Nothing in these drawings or specifications is to be construed to permit work not conforming to these codes. The specifications shall govern in the event that the drawings or specifications call for material or methods of construction of higher quality or standard than required by these codes.
 - 1. California Plumbing Code
 - 2. California Administrative Codes:
 - a. Title 8, Industrial Relations
 - b. Title 19, Public Safety
 - 3. California Electrical Code
 - 4. Standards and Regulations of other agencies or organizations as listed in this specification relating to products or procedures. For example, American Society for Testing and Materials.

1.4 EXPLANATION OF DRAWINGS

- A. The intent of the drawings and specifications is to indicate and specify a complete and efficient irrigation system ready for use in accordance with the

manufacturer's recommendation's, and all applicable local codes and ordinances. Questions concerning interpretation of irrigation plans and specifications shall be submitted to the Landscape Architect.

- B. All plot dimensions are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and shall report any variations to the Landscape Architect.
- C. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all his work, and plan his 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 sprinkler systems, planting, utilities, and architectural features will be avoided.

Contractor shall provide and install any and all material, labor and operations necessary to provide a complete fully functional irrigation system as deemed acceptable by the Owner. No additional compensation will be given to the Contractor for work required by the Owner.

- D. All work called for on the drawings by notes shall be furnished and installed whether or not specifically mentioned in the specifications.
- E. The Contractor shall not willfully install the irrigation facilities as indicated on the drawings when it is obvious in the field that unknown obstructions might not have been considered in the engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect.
- F. The Contractor shall examine carefully the site of work contemplated and the proposal, plans, specifications, and all other contract documents. It will be assumed that the Contractor has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantity of work to be performed and materials to be furnished, and as to the requirements of the specifications. The Contractor shall take necessary precautions to protect existing site conditions that are to remain. Should damage be incurred, the Contractor shall make the necessary repair or replacement to bring it back to its original condition at his own expense.
- G. Prior to cutting into the soil, the Contractor shall coordinate with the Project Inspector locate all cables, conduits, sewers, septic tanks, and other such utilities as are commonly encountered underground and Contractor shall take proper precaution not to damage or disturb such improvements. If a conflict exists between such obstacles, notify the Project Inspector who will consider realignment of the proposed work. The Contractor will proceed in the same manner if a rock layer or any other condition encountered underground makes change advisable. Should utilities not shown on the plans be found during excavations, Contractor shall promptly notify the Project Inspector for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown in plans.

- H. The Contractor shall verify the correctness of all finish grades within the work area in order to insure the proper soil coverage (as specified) of the sprinkler system pipes. The Contractor shall verify and be familiar with location and size of the proposed water supply (P.O.C.). He shall make approved type connection and install new work.
- I. The Contractor shall be responsible for notifying the Project Inspector in the event any equipment or methods indicated on the drawings or in the specifications conflict with local codes, are incompatible or an error is apparent, prior to installing. In the event the Contractor neglects to do this, he will accept full responsibility for any revisions necessary. No additional compensation will be given to the Contractor for necessary revisions resulting from this event.

1.5 PERMITS AND INSPECTIONS

- A. The Contractor shall obtain and pay required fees to any governmental or public agency as required in General Conditions. Any permits for the installation or construction of any of the work included under this contract, which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the Contractor, each at the proper time. He shall also arrange for and pay all costs in connection with any inspections and examination required by these authorities.
- B. In all cases, where inspection of the irrigation system work is required and/or where portions of the work are specified to be performed under the direction and/or inspection of the Inspector of Record the Contractor shall notify the Inspector of Record at least 48 hours in advance of the time when such inspection and/or direction is required. Any necessary re-excavation or alterations to the system needed because of failure of the Contractor to have the required inspection, shall be performed at the Contractor's own expense.

1.6 GUARANTEE

- A. Irrigation system shall be guaranteed for one year from date of final acceptance.

1.7 OPERATIONS AND MAINTENANCE INSTRUCTIONS/RECORD DOCUMENTS

- A. The Contractor shall prepare and deliver to the District within ten (10) calendar days prior to completion of the construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in three individually bound sets of Operating and Maintenance Manuals.
- B. These manuals shall describe the material installed and shall be in sufficient depth to permit operating personnel to understand, operate and maintain all equipment. Spare part lists and related manufacturer identification shall be included for each installed equipment item. Each complete, bound manual shall contain the following information:
 - 1. Index sheet stating Contractor's address and telephone number, duration of guarantee period, and list of equipment, with names and addresses of local manufacturer representatives.

2. The Contractor to issue a "CERTIFICATE OF CONSTRUCTION COMPLIANCE" to the Project Inspector which indicates that all work done, materials and equipment used and installed are in compliance with the approved plans, specifications and all authorized revisions. The certificate shall be in form as required in the Project General Conditions.
 3. Complete operating and maintenance instruction on all major equipment.
 4. Complete set of manufacturer's literature and specifications of material installed, including parts list.
 5. Diagrams for all wiring of controller, controller valves, etc.
 6. Initial electrical data on each control valve.
 - a. Ohmmeter reading for each valve taken at the controller and valve.
 - b. Voltmeter reading for each valve.
- A. The contractor shall furnish one set of bond copies As-Built drawings, and one set of Autocad 2007 drawing files on compact disc of As Builts after all As Built information is transferred to the Auto Cad file as record documents.
1. Label first page of each document, or set of documents, "PROJECT RECORD" in neat large printed letters on lower right hand corner. Record information concurrently with construction progress. This set of drawings shall be kept on the site and shall be used only as a record set. Do not conceal any work until required information is recorded.

These drawings shall also serve as work in progress sheets, and the Contractor shall make neat and legible annotations thereon daily as the work progresses, showing the work as actually installed. These drawings shall be available at all times for inspection and shall be kept in a location designated by the Project Inspector.
 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, by RFI, or by Change Order.
 - d. Details not on original Contract Drawings.

3. Deliver all Record Documents (As-Builts) to Owner. 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.
- B. The Contractor shall provide one controller chart for each controller installed. The chart will show the area irrigated by the controller and shall be the maximum size the controller door will allow. The chart may be a reduced drawing of the actual plans. The chart shall be colored with a different color for each station. The chart shall be laminated or covered in a watertight envelope.
- C. The Contractor shall provide three (3) copies of laminated, typewritten legible controller programming charts for each individual controller. The chart shall show all stations on controller, run times, start times and program.

1.8 SUBMITTALS

- A. Contractor shall submit six (6) copies of complete lists of proposed materials to the Owner, including manufacturer's name and catalog numbers. No substitution will be allowed without prior written approval by the Landscape Architect.
- B. Shop drawings shall follow for all equipment, including dimensions, capacities, and other characteristics as listed in product specifications. Materials and equipment shall not be ordered until given written approval by the Landscape Architect.
- C. When specific name brands of equipment and materials are used, they are intended as preferred standards only. This does not imply any right upon the part of the Contractor to furnish other materials unless specifically approved in writing as equal in quality and performance by the Landscape Architect. Decisions by the Landscape Architect shall govern as to what name brands of equipment and materials are equal to those specified on the plans and his decisions shall be final.
- D. It shall be the responsibility of the prospective bidder to furnish proof as to equality of any proposed equipment or material.
- E. Approval of any item, alternate or substitute indicates only that the products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.
- F. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

- G. Acceptance of any submittals, deliverables, or other work product of the Contractor shall not be construed as assent that contractor has complied, nor in any way relieved the Contractor of, compliances with (i) the applicable standard of care of (ii) applicable statutes, regulations, rules, guidelines and contract requirements.

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. NEC - National Electrical Code.
 - 5. UL - Underwriter's Laboratories

1.10 REJECTION OF MATERIAL OR WORK

- A. The Landscape Architect reserves the right to reject any material or work which does not conform to the contract plans, specifications without any written approval from the Landscape Architect. The rejected material or work shall be removed or corrected by the Contractor at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Piping:
 - 1. Pressure pipe/upstream of control valve:
 - a. 2 ½" and larger: Bell end 'O' ring gasketed 'Purple Tinted' PVC 1120 Class 200 SDR 21 high impact pipe (ASTM D1784 and ASTM D2241).
 - b. 2" and smaller: Solvent weld bell end 'Purple Tinted' PVC 1120 Schedule 40 high impact pipe (ASTM D1785 and ASTM D1784).
 - 2. Lateral line/downstream of control valve:
 - a. Solvent weld bell end 'Purple tinted' PVC 1120 Schedule 40 high impact pipe (ASTM D1784 and ASTM D1785).

3. Sleeving under paving:
 - a. Solvent weld bell end PVC 1120 Schedule 40 high impact pipe (ASTM D1784 and ASTM D1785).
4. All pipe shall be continuously and permanently marked and conform with the following information:

Manufacturer's name or trademark, nominal pipe size, schedule and type of pipe, pressure rating in PSI and (NSF) seal of approval.

 5. Pipe shall be of improved white rigid polyvinyl chloride (PVC) compound manufactured by Lasco Industries or approved equal.
 6. For connections between mainlines and electric control valves, Schedule 80 PVC ASTM D2464.

B. Fittings:

1. For PVC plastic pipe: white rigid polyvinyl chloride (PVC) Schedule 40 type I and II grade 1, solvent weld socket fittings ASTM D2466 for all lateral lines 2 ½" and smaller, gray rigid polyvinyl chloride (PVC) Schedule 80, grade 1, solvent weld socket fittings ASTM D2467 for all lateral line pipe 3" and larger. Ductile Iron deep bell epoxy coated gasketed fittings, AWWA C153, Class 350, Grade 65-45-12, ASTM A-536, push on joints with EPDM gaskets meeting ANSI / AWWA C111 / A21.11 and four (4) cast lugs for joint restraints as manufactured by Leemco, Inc. (909) 422-0088, or approved equivalent, for all mainline pipe. Joint restraints shall be provided at all elbow, tees, bends, etc. for all mainline pipe. Joint restraints shall be Leemco, Inc. (909) 422-0088 epoxy coated LH series joint restraint for IPS pipe, or equivalent. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable (IPS) schedule, and (NSF) seal of approval.
2. All plastic fittings and connectors shall be injection molded of an improved polyvinyl chloride compound featuring high tensile strength, high chemical resistance and high impact strength in terms of current ASTM standards for such fittings and as manufactured by Lasco Industries or approved equal. Where threads are required in plastic fittings, these shall be injection molded also.
3. Saddles shall be used for all connections between mainline and electric control valves, blow off valves, air release valves and quick coupling valves. Saddles shall be coated ductile iron with two (2) stainless steel straps. Romac Industries (800) 426-9341, #202NS or equivalent.

C. Galvanized pipe and fittings:

1. Galvanized Pipe shall be hot dip galvanized continuous welded, seamless steel pipe SCH 40 conforming to applicable current (ASTM) standards.
2. Galvanized Fittings shall be galvanized malleable iron ground joint SCH 40 conforming to applicable current (ASTM) standards.

D. Solvent Weld Adhesive:

1. All socket type connections shall be joined with primer and PVC solvent cement which shall meet the requirements of ASTM F656 for primer and ASTM D2564, "Standard Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings." Solvent cement joints for plastic pipe and fittings will be made as prescribed by manufacturer. The high chemical resistance of the pipe and fitting compounds specified in the foregoing sections makes it mandatory that an aggressive colored primer, which is a true solvent for (PVC) be used in conjunction with a solvent cement designed for the fit of pipe and fittings of each size range specified. A medium bodied solvent cement to be used on pipe joints with interference fits only and not with Schedule 80 fittings. A heavy bodied solvent cement can be used for all classes and schedules of pipe and fittings.

E. Pipe Thread Sealant:

1. A non-hardening all purpose sealant and lubricant similar to Permatex or Lasco pipe thread sealant which is certified by the manufacturer to be harmless to PVC pipe and fittings. Apply sealant to clean male threads, brushing into grooves and to the first three threads of the female threads. A good quality grade of teflon tape recommended by the manufacturer for use with plastics may also be used. Minimum width of tape to be used is 3/4". A minimum of two wraps and a maximum of three wraps to be used.

2.2 VALVES

- A. Electric Control Valves: Globe valves operated by low-power solenoid, normally closed, manual flow adjustment. Sizes and types as shown on drawings.
- B. Control Wire: Paige irrigation control wire direct burial with polyethylene jacket, AWG-PE type UL approved for direct burial, minimum size #14 or equivalent.
- C. Control Wire Connectors: 3M DBR/Y-6 Direct Bury splice kit, and connectors or equivalent.
- D. Control Wire Marking: T. Christy Enterprises wire marker, "Purple" with controller letter and station number in "Black", or equivalent.
- E. Control Valve Boxes: Old Castle / Carson 1419 and 1220 with lockable 'Purple' plastic covers or equivalent.

- F. Mainline and Quick Coupler valve boxes: Old Castle / Carson 910 with lockable 'Purple' plastic covers or equivalent.
- G. Mainline valve: Nibco cast iron resilient wedge valve w/ operating nut. Conforming to AWWA C-509 or equivalent.
- H. Quick Coupling Valve: Two piece quick coupling valve as shown on plan.
- I. Control valve box marking: Heat imprinting on top of lid with 2" high letters showing controller letter and station number.

2.3 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 memory arc, balanced nozzle sets. Refer to schedule on drawings. Manufacturer's numbers are listed with description.
- A. Dripline: Polyethylene tubing with inline emitter. Pre-emergent herbicide impregnated self-cleaning emitter welded to dripline wall. Refer to schedule on drawings. Manufacturer's numbers are listed with description.

2.4 CONTROLLER

- A. Solid state microcomputer controller, completely automatic in operation, which shall electrically start the sprinkler cycle and program and time the individual stations, capable of accessing weather information and adjusting station run times for current weather conditions. Controller shall have attached instruction booklet, integral 24V transformer, clock indicating time of day and day of week, 24V master valve circuit and terminal connection strip. Controller shall be universal remote ready with pre-installed connectors.

2.5 OTHER MATERIALS

- A. Materials not specifically indicated but necessary for proper execution of this work shall be of first quality as selected by the Contractor subject to the acceptance of Landscape 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 plans 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 SYSTEM DESIGN

- A. Design pressure and flow as indicated on drawings.
- B. Contractor shall verify design layout and specifications as specified on drawings and inform the Owner of discrepancies, errors or incompatibilities in writing prior to installation of irrigation system. Failure to inform the Owner of any discrepancy seven working days prior to beginning system installation will institute the responsibility of corrective action to the Contractor at no expense to the Owner.

3.2 PIPING INSTALLATION

A. General:

- 1. Any equipment installed by the Contractor and deemed to be for the use of the State in various situations (i.e., control valves, control panels, etc.) shall be so installed to be readily accessible and quickly operable. Equipment deemed by the Owner to be inoperable for its intended purpose shall be reinstalled by the Contractor in an operable position before approval will be given. Any changes made by the Contractor shall be done without any additional cost to the Owner.
- 2. The Contractor shall be responsible for layout of proposed facilities and any minor adjustments required due to differences between site and drawings. Any such deviations in layout shall be within the intent of the original drawings, and without additional costs to the Owner. The Landscape Architect will indicate the proposed precise location of the control panels. Head spacing on drawings is diagrammatic. Head spacing and patterns shall be adjusted to provide complete and adequate coverage with a minimum spray on non-planted areas. Where head spacing is not noted, Contractor is to install sprinkler heads evenly along the irrigation area's perimeter. Flush all lines prior to installation of heads.
- 3. Support piping without strain on joints or fittings and allow for piping expansion and contraction. "Snake" pipe into trench in accordance to manufacturer's recommendations to allow for expansion. Lay on solid sub-base, at uniform depth.

- B. The Contractor shall examine all other portions of working drawings and plan trenching and pipe lays so that no conflict will arise between irrigation and any other work. Any corrective action will be the Contractors responsibility at no further expense to the Owner.

C. Excavations:

- 1. Excavations shall be open vertical construction, sufficiently wide to provide free working space around the work installed and to provide ample space for backfilling and tamping.
- 2. The use of a vibratory plow or methods other than open vertical trenching will not be allowed without the written approval of the Landscape

Architect. To obtain such approval, a field test must be performed, at the proposed site, with the equipment to be used in the presence of the Landscape Architect. The field test is to indicate if the proposed site is favorable to the plowing method. Approval for plowing at one location does not allow the use of plowing at another location. Approval for plowing must be obtained for each location where the use of plowing is proposed. If, at previously approved plowing locations, conditions for plowing become unfavorable as determined by the Project Inspector or Landscape Architect, plowing shall be terminated.

3. Trenches for pipe and equipment shall be cut to required grade lines, and compacted to provide an accurate grade and uniform bearing for the full length of the line.
4. When two pipes are to be placed in the same trench, it is required to maintain a minimum four inch (4") horizontal separation between pipes.
5. Depth of trenches shall be sufficient to provide a minimum cover above the top of the pipe as follows:
 - a. 24-inch over main lines.
 - b. 12-inch minimum over non-pressure lateral lines.
 - c. 24-inch minimum over lines located out in road surface area of paved streets.
6. Maximum cover above the top of the pipe shall not exceed twelve inches (12") greater than the required minimum cover.

D. Assemblies

1. Routing of pressure supply lines as indicated on drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with details on plans.
2. Install all assemblies specified herein according to the respective detail drawings or specifications pertaining to specific items required to complete the work. Perform work according to best standard practice, with prior approval.
3. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
4. All brass pipe and fittings shall be assembled using an approved teflon tape, or equivalent, applied to the male threads only. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved teflon tape will be required.
5. All plastic and galvanized steel threaded pipe and fittings shall be assembled using an approved teflon tape applied to the male threads

only. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved teflon tape will be required.

6. No elbows, tees or valves are to be located closer than five (5') feet of each other without prior approval of the Project Inspector.

E. Line Clearance

1. All lines shall have a minimum clearance of four inches (4") from each other, and six inches (6") from lines of other trades. Parallel lines shall not be installed directly over one another.

F. Plastic to Steel Connections

1. At all plastic (PVC) pipe connections, the Contractor shall work the steel connections first. Connections shall always be plastic into steel, never steel into plastic. An approved teflon tape shall be used on all threaded (PVC) to steel, never steel into plastic. An approved teflon tape shall be used on all thread (PVC) to steel pipe joints applied to the male threads only, and light wrench pressure is to be applied. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved 3/4" wide teflon tape will be required.
2. A non-hardening sealant and lubricant similar to Permatex #51 or LASCO blue pipe sealant may be used in lieu of teflon tape. Apply sealant to clean male threads brushing into grooves and to the first three threads of the female threads.

G. Plastic Pipe

1. The Contractor shall exercise care in handling, loading, unloading, and storing plastic pipe and fittings. All plastic pipe and fittings shall be stored under a weatherproof roofed structure before using and shall be transported in a vehicle with a bed long enough to allow the length of pipe to lie flat so as not to be subject to undue bending or concentrated external load at any point.
 - a. All lumber, rubbish, rubble, concrete and rocks shall be removed from the trenches by the Contractor. Pipe shall have a firm uniform bearing for the entire length of each pipe line to prevent uneven settlement. Wedging or blocking under riser tees shall be done only if specified on the plans. Pad trenches with soil as necessary to provide uniform bearing surfaces.
 - b. Where extensive lengths of pipe are installed, snake pipe in trench from side to side to allow for expansion and contraction. One additional foot per one hundred (100) feet of pipe is the minimum allowance for snaking. Never lay pipe when there is water in the trench or when the temperature is 32 degrees F or below.

- c. All changes in direction of pipe shall be made with fittings, not by bending.
- d. Make solvent weld joints with a non-synthetic bristle brush in the following sequence:
 - 1) Make sure pipe is cut square and all rough edges and burrs are removed. All connecting surfaces are properly cleaned and dry prior to application of pipe primer.
 - 2) Apply an even coat of colored primer to pipe and fitting prior to application of solvent.
 - 3) Apply an even coat of solvent to the outside of the pipe, making sure that the coated area is equal to the depth of the fitting socket.
 - 4) Apply an even light coat of solvent to the inside of the fitting.
 - 5) Apply a second coat of solvent to the pipe.
 - 6) Insert the pipe quickly into the fitting and turn pipe approximately one-eighth to one-quarter turn to distribute the solvent and remove air bubbles. Hold the joint for approximately fifteen seconds so the fittings do not push off the pipe.
 - 7) Using a clean rag, make sure to wipe off all excess solvent to prevent weakening at joint.
 - 8) Exercise care in going to the next joint so that pipe is not twisted, thereby disturbing the last completed joint.
 - 9) Allow at least fifteen minutes setup time for each welded joint before moving.
 - 10) Repairing plastic pipe when damaged shall be done by replacing the damaged portion of pipe.

H. Concrete Thrust Blocks:

- 1. Concrete anchors or thrust blocks shall be provided on main pipelines at abrupt changes in pipeline grade, changes in horizontal alignment (elbows, tees and crosses), reduction in pipe size (reducers, reducing tees or crosses), end-line caps or plugs, and in-line valve to absorb any axial thrust of the pipeline. The pipe manufacturer's recommendation for thrust control shall be followed. Thrust blocks must be formed against solid unexcavated earth (undisturbed). Do not enclose entire joint in concrete. Provide a minimum of three (3) cubic feet of 3,500 PSI concrete for each concrete thrust block.

3.3 HEAD INSTALLATION

- A. Equipment spacing on drawings is diagrammatic. Spacing shall be adjusted to provide complete and adequate coverage with a minimum water loss on non-planted areas. Flush all lateral and mainlines lines prior to installation of equipment.
- B. Rotary pop-up sprinkler heads adjacent to walks or mowstrips shall be set four inches (4") from edge of walk or mowstrips and pop-up spray heads adjacent to walks or mowstrips shall be set one inch (1") minimum/two inches (2") maximum from edge of walk or mowstrips or as noted otherwise on the plans and details.
- C. Upon completion of the installation, the Contractor shall adjust all individual systems to properly distribute water flow and shall place entire irrigation system in first-class operating condition.
- D. Adjustable heads shall be adjusted by fully opening the head furthest from the control valve. Adjust sprinkler heads which spray toward buildings in shrub / turf areas so that water does not contact sides of buildings.
- E. Install irrigation heads in accordance with details on plans.

3.4 PIPE DEPTH AND BACKFILL

- A. Backfill shall not be placed until the installed system has been inspected and approved by the Project Inspector.
- B. Backfill material shall be approved soil. Unsuitable material, such as pipe remnants and wire including clods and rocks over two inches (2") in size, shall be removed from the premises and disposed of legally at no cost to the Owner. Backfill for first six inches (6") around mainline pipe and control wires shall be native soil.
- C. All backfilling shall be done carefully and shall be properly tamped. All soil shall be tamped and puddled to eliminate any voids.
- D. Surplus earth remaining after backfilling shall be disposed of off site.
- E. Backfilling for all pipe shall be carried out in two basic stages.

- 1. Stage One Backfilling:

This shall be accomplished as soon as possible after the pipe is laid. A bedding of uniform depth with no voids must be provided along the entire length of the pipe. The bedding dirt should be placed in the trench and tamped into the areas under the pipe, using a suitable tool. Joints should be left exposed until hydrostatic tests are completed. Cover only those portions of the pipe necessary to prevent movement or damage.

- 2. Stage Two Backfilling:

This shall be completed after all hydrostatic tests are completed and the piping system has been thoroughly checked for leaks or other defects. Continue to add backfill soil in four inch (4") layers and hand tamp to achieve density similar to adjacent soil. After twelve inches (12") in main line trenches and eight inches (8") in lateral line trenches of hand tamped soil is in place over the pipe and fittings, backfilling can be continued, using light machinery to place dirt in the trenches in six inch (6") layers and to compact the dirt to conform to adjacent soil. Extreme care should be taken to avoid damage to the pipe from machinery that is too heavy.

All trenches shall then be water jetted to assure uniform settling and compaction. Backfilling operations will not be considered complete until the top surface has been graded to conform to the adjacent soil. All rocks uncovered and not used as backfill must be collected and removed from the site.

- F. PVC piping and fittings shall not be backfilled during periods of extreme heat or when a sudden lowering of temperature of the pipe may cause separation of joints or fittings.

3.5 CONTROL WIRE

- A. Install control wires running alongside of irrigation mainline. Provide minimum of six inches (6") separation to irrigation mainline. Minimum cover shall be 24 inches. Provide 1" PVC conduit for irrigation two wire system control wires. Provide long radius sweep elbows at all turns in conduit route and at all valve boxes for the two wire system. Crimp wires together at valve manifold with wire connector. Seal splice with 3M DBR/Y-6 splice kit or approved equal. Tag all control wire splices and at control valve and controller with approved control wire markers.
- B. Wire size shall be determined by the number of valves operating on a given wire and the distance from the controller to the farthest valve, as specified by the charts furnished by the remote control valve manufacturer. Splices are not encouraged but allowed. All splice connections must be provided in a valve box.

3.6 ELECTRIC CONTROL VALVES

- A. Electric control valves shall be adjusted so the most remote heads operate at the pressure recommended by the head manufacturer. Electric control valves shall be adjusted so a uniform distribution of water is applied by the heads to the planting areas for each individual valve system. The Contractor shall make all necessary connections for operation. Where pressure regulating electric control valves are called for the Contractor shall adjust the valve so a uniform distribution of water is applied by the heads.
- B. Valve boxes and lids shall be set to finished grade or as indicated on the Construction Plans. Heat imprint electric control valve identification numbers on top of valve box with two inch (2") high letters. Not more than one electric control valve may be installed in each box.

- C. Electric control valves shall be connected and aligned to provide the most efficient flow of water to the irrigation heads. Each valve is to be enclosed in the specified valve box. The valve box shall be secured on firm soil clear of valves and wiring connections. Backfill carefully to prevent settlement and subsequent damage.
- D. A valve box must be provided at all underground irrigation control wire splice connections.

3.7 AUTOMATIC CONTROLLER

- A. Contractor shall be required to program and schedule the controller to maximize and utilize the design flow indicated. Programming and scheduling shall be compatible with controller on site. It shall be the complete responsibility of the Contractor to ensure that the controller provides for a fully functioning, smooth running irrigation system. Contractor shall provide all wiring and rewiring of irrigation controller necessary to accomplish programming and scheduling which utilizes the design flow indicated.
- B. Install controller, pedestal, and accessories per manufacturer's approved details, construction plans and contract requirements.
- C. Install automatic controller chart in laminated or watertight plastic envelope inside controller cover showing which valves are connected to which stations on controller.
- D. Controller Charts:
 - 1. The Contractor shall provide one controller chart for each controller supplied.
 - 2. The chart shall show the area controlled by the automatic controller and shall be the maximum size that the controller door will allow.
 - 3. The chart may be a reduced drawing of the actual as-built system. However, in the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a size that will be readable when reduced.
 - 4. The chart shall be colored with a different color for each station.
 - 5. The chart shall be a permanent photo copy or approved equal and enclosed in a waterproof envelope or laminated.
- E. Provide three (3) copies of laminated, typewritten, legible programming charts for each controller. Charts shall show all stations on the controller, run times, start times for each individual program on the controller.

3.8 ELECTRICAL SERVICE

- A. Electrical service shall be provided to booster pump, as indicated on the plans. All work shall be in conformance to all local ordinances, codes, regulations and requirements. All cost for the electrical service is to be the responsibility of the Contractor.

3.9 TESTING

- A. General: Unless otherwise directed, tests shall be witnessed by the Landscape Architect. Work to be concealed shall not be covered until prescribed tests are made. Should any work be covered before such tests, the Contractor shall, at his expense, uncover, test and repair his 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: 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 (+ 5PSI).

3.10 INSPECTION

- A. Inspection of Work:
 - 1. Installation and operations must be approved by the Project Inspector.
 - 2. In no event shall the Contractor cover up or otherwise remove from view any work under this contract without prior approval of the Project Inspector. Any work covered prior to inspection shall be opened to view by the Contractor at his expense.
- B. General Inspection: Periodic inspections shall be required for basic operations and installations during progression of the project. Such inspections will include but not necessarily be limited to the following items:
 - 1. Layout and flagging of sprinkler heads and system.
 - 2. Trenching.
 - 3. Wire placement.
 - 4. Partial fill compaction of trenches.
 - 5. Control valve installation.
 - 6. Irrigation controller installation and operation.
 - 7. Mainline sustained pressure check.
- C. Coverage Test: When the irrigation system is completed, the Contractor in the presence of the Project Inspector shall perform a coverage test of water afforded in the planting areas. Contractor is required to provide 100% complete coverage

of all planting areas through the irrigation system. 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: The work will be accepted in writing when the entire project improvements have been completed satisfactorily to the Landscape Architect as stated in Section 32 93 00 Plants, Part 3.8. 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 MAINTENANCE

- A. Adjustments: Irrigation system shall be maintained and adjusted as required to provide proper coverage throughout the 90 day maintenance period. Irrigation system maintenance shall commence upon general inspection following irrigation installation, planting operations and general clean-up. Maintenance shall be continued until final acceptance.

After the system has been completed, the Contractor shall instruct an authorized representative of the Owner in the operations and maintenance of the system and shall set the desired controller irrigation time for each station.

3.12 GUARANTEE

- A. The entire irrigation system shall be guaranteed by the Contractor to give satisfactory service and to the quality of materials equipment and workmanship including settling of backfilled areas below finish grade for a period of one (1) year following the date of the final acceptance of all the work by the Landscape Architect. If, within one year from the date of completion and final acceptance of all of the work, any trouble develops resulting from inferior or faulty materials or workmanship or settlement occurs and adjustments in pipes, valves, and heads, sod, or paving to the proper level of the permanent grades, the Contractor, as part of the work under his contract, shall make all adjustments and corrections without extra cost to the Owner, including the complete restoration of all damaged planting, paving, or other improvements of any kind.
- B. The Owner reserves the right to make temporary repairs as necessary to keep the irrigation system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.
- C. Should any operational difficulties in connection with the irrigation system develop within the specified guarantee period which in the opinion of the Landscape Architect may be due to inferior material and/or workmanship, said

difficulties shall be immediately corrected by the Contractor to the satisfaction of the Owner at no additional cost to the Owner including any and all other damage caused by such defects.

END OF SECTION

SECTION 329300

PLANTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide all material, labor, equipment and services necessary to do all Landscape Work and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded.
- B. The landscape work includes, but is not necessarily limited to the following:
 - 1. Fine grading, cross-ripping of compacted soil, soil preparation, topsoil and weed control.
 - 2. Planting and staking as per drawings and specifications.
 - 3. Tree hole boring for all trees on plan.
 - 4. Ninety-day maintenance.
 - 5. Decomposed granite surfacing.
 - 6. Root barriers.
- C. All other requirements appear in the following sections: Part 1, Part 2 and Part 3.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification Sections, apply to work of this section.

1.3 DEFINITIONS

- A. The term "approved" shall mean by the Architect, and only in writing.

1.4 QUALITY ASSURANCE

- A. Landscape work shall be performed by a single firm specializing in landscape work.
- B. Plant measurements shall be as follows: 36" box size caliper shall be at least two and one half inches (2-1/2") in diameter, measured six inches (6") from container soil level, 24" box size caliper shall be at least one and one half inches (1-1/2") in diameter, measured six inches (6") from container soil level, 15 gallon size caliper shall be at least three quarters inch (3/4") in diameter measured six inches (6") from container soil level. Where not shown, plants shall be of uniform, standard size,

neither overgrown and root bound, nor too recently canned so that the root system is not thoroughly established through can. Pruning shall not be done prior to delivery except by prior approval.

C. Inspection:

1. All landscape work and materials shall comply with applicable Federal, State, County and City regulations. All plant material shall conform to State of California Grading Code of Nursery Stock, No. 1 grade for quality and size and also ISA Standards. Use only nursery grown stock.
2. All plant material shall be subject to inspection upon delivery to the project site by the Owner and Landscape Architect. Approval shall not limit the right of rejection during progress of the work for condition of the root ball, size, variety, latent defects or injuries. Rejected plants shall be removed from the site and replaced immediately by the Landscape Contractor at no additional cost to the Owner.

D. Qualifications of Workmen

1. Employ skilled workmen who are thoroughly trained experienced in landscaping and who are completely familiar with specified requirements and methods needed for proper performance of the work in this section.
2. Provide adequate supervision by a qualified foreman.

E. Soil Fertility Analysis

1. The Contractor shall provide, and pay for, a fertility analysis of the existing soil on the project site after rough grading operations have been completed, but before any top soil is imported and placed on site. The samples shall be collected for the fertility analysis by collecting a minimum of 10 representative samples of the soil throughout the site. Each sample shall be a minimum of .25 cubic foot each, and shall be thoroughly mixed together to prepare a homogenous 2.5 cubic foot sample. A one cubic foot sample shall be submitted to the soil testing laboratory as a representative sample for fertility analysis. The Contractor shall submit to the Landscape Architect for review, the results of the soil testing investigations before proceeding with any soil improvement activities such as fertilizing, and/or adding of amendments.
2. Recommendations for improvement of the soil conditions for plant growth shall be made by the testing laboratory, and at a minimum, shall include the following:
 3. A fertilizer and amendment application program (including macro and micro nutrients).
 4. Treatments to improve soil PH for optimum plant growth.

F. Bidding Allowance

1. The Contractor shall prepare his bid for the project based upon the type and quantities of soil amendment and fertilizer specified herein. The Contractor's bid price shall also include a \$4,000.00 bidding allowance for additional work and amendments / fertilizer required by the Owner to be provided for the project after review of the fertility analysis. If the soil analysis reveals that the

amendment program is sufficient and does not need altering the Contractor shall credit back the Owner the full bidding allowance. If a minor amendment adjustment is made and the Owner considers the change has a value less than the bidding allowance amount the Contractor shall provide a credit to the Owner for a portion of the bidding allowance in the amount agreed upon by the Contractor and Owner.

1.5 SUBMITTALS

- A. Submit six (6) copies of:
 - 1. A complete materials list of all items proposed to be furnished.
 - 2. Certificates of inspection as may be required by government agencies (providing duplicate copies for the Architect).
- B. Soil amendment: Submit one (1) pint sample and analysis of soil amendment and mulch.
- C. Samples: When requested by the Owner.
- D. Submit invoices from material suppliers for all amendments, fertilizer, seed, plants, mulch and any other materials provided for the landscape installation to the Landscape Architect. Contractor shall submit invoices at any stage of installation as requested by the Landscape Architect.

1.6 AVAILABILITY

- A. The Landscape Contractor shall confirm availability of plants, supplies, and materials prior to submitting his landscape bid. Variety substitutions are not desired.
- B. If a plant is found not to be available, the Landscape Contractor is to notify the Landscape Architect before bidding. The Landscape Architect will then select a reasonable alternate and inform all those bidding of the availability of the original plant. If a substitute is selected it must be of the same size, value and quality as the original plant. Failure to inform the Landscape Architect of unavailable plants prior to bidding will result in assumption that all plants specified will be provided by the Landscape Contractor at time of installation. No substitution will be allowed after award of contract.
- C. Plant size listed on construction documents are minimum acceptable sizes. If plant material specified is not substituted prior to award of contract the minimum specified size shall be provided by the Contractor. If the Contractor cannot provide the minimum specified size plant material at the time of installation, the Contractor shall be required to install a larger sized container of the plant specified at no additional cost to the Owner.

1.7 PROJECT CONDITIONS

A. Existing Conditions

1. The Landscape Contractor is to visit the job site to verify existing conditions including soils, vegetative growth, existing grade, subsurface conditions, drainage, etc. making allowances in his bid for any required work to provide the landscape installation as specified in the construction documents.
2. The Landscape Contractor shall notify the General Contractor to locate underground lines prior to hole boring or trenching. Do not permit heavy equipment such as trucks, rollers, or tractors to damage utilities. Hand excavate as required to minimize possibility of damage to underground utilities. Maintain grade stakes set by others until removal is mutually agreed upon by all parties concerned. Prevent damage to temporary risers of underground irrigation system and similar obstructing work located in the landscape areas.
3. If there is a conflict with the utilities and the planting, Contractor shall notify the Owner for instructions as to further action. Failure to do so will make Contractor liable for any and all damages thereto arising from his operation.

B. Environmental Requirements

1. No plants shall be planted in situations that show obvious poor drainage. Such situations shall be corrected by the Landscape Contractor as directed by the Landscape Architect and the Owner. Corrections shall be provided by the Landscape Contractor at no additional cost to the Owner.

C. Protection

1. The Landscape Contractor shall guarantee repair of damage to any part of the premises resulting from leaks, defects in materials, equipment or workmanship. The Landscape Contractor shall be liable for any and all accidents resulting from his work, including open holes and trenches during construction.
2. During landscape work, store materials and equipment where directed. Keep pavements clean and work area in an orderly condition.
3. Protect landscape work from theft, loss, damage and deterioration during storage, installation and maintenance periods. Protect from unauthorized persons (trespassers) as well as from operations by other contractors and tradesmen, and landscape operations. Protect all planted turf and shrub areas from persons as well as operations of other contractors and the Owner. Cost for protection shall be borne by the Contractor. Means of protection such as temporary fencing shall be approved by the Owner.
4. Contractor shall repair or restore damaged work as identified by the Landscape Architect to an acceptable condition. No additional payment will be made to the Contractor for repair of unprotected material.

1.8 INSPECTION

A. Periodic inspections will be made by the, Landscape Architect during the installation for the project. Such inspections will include but not necessarily be limited to:

1. Stockpiled imported soil and soil amendments prior to installation.
2. Weed control operations prior to other portions of work.
3. Placement of plant material at the site prior to planting.

4. Condition of plant material prior to placement.
 5. Auguring, digging and preparation of plant pits for trees and shrubs.
 6. Planting and staking of trees.
 7. Planting of shrubs and ground cover.
- B. Any corrective action called for by any of the above listed authorities shall be immediately performed by the Contractor.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Plant label shall identify each specie and variety. A label shall be attached to each individual plant or block of identical plants grouped together.
- B. Adequately protect plants from sun and wind prior to planting. Do not allow stored plant material to dry out at any time.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Soil Amendment
1. Turf and Planting Areas: "Harvest Premium" as supplied by Waste Management, Fresno (559) 753-0040 or equivalent and conforming to the following:
 - a. Derivative material – mixture of 50% composted / decomposed, shredded, chipped greenwaste organic matter and 50% composted dairy manure.
 - b. Particle size - 3/8".
 - c. PH Value - 5.9/6.7.
 - d. Macro-nutrients – 1.3% Nitrogen, 0.47% Phosphorus, 1.7% Potassium.
 - e. Moisture holding capacity - 4 times by volume.
 - f. Composted to provide carbon: nitrogen ratio -11:1 to 13:1 maximum.
 - g. Salinity / Cation Exchange -13% / 541%.
 2. Turf and Planting Areas: Super Cal 75 gypsum as supplied by Waste Management, Fresno (559) 753-0040. Gypsum shall be mined gypsum composed of no less than 75% pure CAS042H20 hydrated calcium sulfate or equivalent.
 3. Turf and Planting Areas: Tri-C Enterprises P. O. Box 1367, Chino, CA 91708-1367 (800) 927-3311. Tri-C Humate containing 40% Humic Acid derived from Leonardite or equivalent.
 4. Turf and Planting Areas: Tri-C Enterprises P. O. Box 1367, Chino, CA 91708-1367 (800) 927-3311. Tri-C Endo 120 Mycorrhizae containing 60,000 living propagules of glomus intraradices per one pound, or equivalent.
 5. Turf and Planting Areas: Soil Sulfur as supplied by Wilbur / Ellis (559) 442-1220, or equivalent.
 6. Turf and Planting Areas: Quantum Growth, Quantum Light and Quantum

Revive liquid organic soil amendments as supplied by Agro Natural Sciences, 352 West Bedford, Suite 112, Fresno, CA. (866) 571-3277, or equivalent.

7. Turf and Planting Areas: Ferrous Sulfate 20% and Manganese Sulfate 31% as supplied by Wilbur / Ellis (559) 442-1220, or equivalent.

B. Imported Topsoil

1. Clean, friable, sandy loam with no noxious weeds, clods, or other extraneous material.
2. The Owner reserves the right to take samples of imported topsoil have tested at Contractor's expense, and reject topsoil as deemed necessary.
3. Particle size distribution.
 - a. Minimum 95% passing a 25.4 mm screen.
 - b. Minimum 85% passing a 9.5 mm screen.
 - c. Fraction passing a 9.5 mm screen shall contain a minimum of 15%, maximum 40% total silt and clay.
4. Agricultural Suitability:
 - a. Salinity (exec 103) less than 4.0 at 25 degrees centigrade.
 - b. Sodium absorption ration (SAR) less than 10.
 - c. Boron in saturation extract less than 1.0 PPM.

C. Fertilizer

1. Trees and Shrubs:
 - a. Fertilizer for all trees and shrubs to be Best-Paks (20-10-5) with Polyon by Simplot Turf (800) 992-6066 or equivalent. The Best-Pak tablets shall be applied at the following rates:

1 Gallon Can	-	1 Paks
5 Gallon Can	-	3 Paks
15 Gallon Can	-	9 Paks
24" Boxes	-	18 Paks
36" Boxes	-	28 Paks

2. Planting Areas:
 - a. The pre-plant fertilizer shall be commercial fertilizer Best (12-12-12) or equivalent.
 - b. The post-plant fertilizer shall be commercial fertilizer Best Triple Pro (15-15-15) with minors or equivalent.

D. Mulch

1. "Gorilla Hair" shredded cedar bark, natural color, free of sticks, dirt, dust and other debris, or equivalent and accepted by Landscape Architect.
2. Particle size: ½" to 2" in general size.

E. Staking Material

1. 2 inch diameter lodgepole pine, pressure treated, pointed one end.
2. V.I.T. Cinch Tie, 32 inches long, V.I.T. Products, Inc. (619) 673-1760 or equivalent.

F. Plants

1. Plants shall be typical of their species and variety, shall have normal growth habits, well developed branches and be densely foliated, and shall have fibrous root systems. No substitutions will be allowed unless approved in writing by the Landscape Architect.
2. Plants shall be free from defects and injuries including disease, insects, insect eggs and larvae and girdled roots.
3. Quality and size of plants, spread or roots, caliper and size of balls shall be in accordance with ANSI Z60.1-1969, "American Standard for Nursery Stock".
4. Plants shall not be pruned before planting.
5. Plant material must be selected from nurseries that have been inspected by State or Federal Agencies.
6. Plants shall be nursery grown and shall have been transplanted or root pruned at least once in the past three (3) years. Plants shall have been grown under climatic conditions similar to those in the locality of the project.
7. Each bundle of plants shall be properly identified by weatherproof labels securely attached thereto before delivery to the project site. Label shall identify plant by name.
8. Nomenclature shall be in accordance with Hortus III.
9. No plants shall be delivered to the project site, except for required samples, until inspection has been made in the field or at the nursery, or unless specifically authorized in writing by the Landscape Architect.
10. Collected plant material may be used only when approved. Approval shall not limit the right of rejection during work progress for conditions of the root ball, latent defects or injuries.
11. Where shown as "MULTI" provide trees with branching starting close to the ground in the manner of a shrub.
12. Plants are listed on the planting plan as the minimum acceptable sizes. The quantities listed are the Landscape Architect's estimate only. The Landscape Contractor is responsible for all material shown on the plan.

G. Root Barrier

1. Deep Root Corporation #UB 24 PANEL, (714) 898-0563 or equivalent.

H. Decomposed Granite Surfacing

1. ¼" to fine chipped angular stone 'California Gold' as distributed by Rosenbalm Rockery Inc. (559) 256-3900. Finish depth of material shall be 3" deep after compacting to a minimum of 85%. Submit sample of granite and source for review before purchasing and delivery to the job site.

I. Organic "Stabilizer"

1. Organic, non toxic, colorless, odorless organic binder derived from natural sources of Psyllium as distributed by Rosenbalm Rockery Inc. (559) 256-3900, and known as "Stabilizer", or approved equal. "Stabilizer" shall be applied to the decomposed granite areas as designated on the plans which will receive

the organic" Stabilizer".

2. Blend 12 lbs. of "Stabilizer" per ton (2,000 lbs.) of decomposed granite per manufacturer's recommendations to stabilize subject surfacing to a depth of no less than three (3) inches below finish grade. The decomposed granite areas shown to receive the "Stabilizer" shall be graded, prepared, mixed, wetted, and finished as further recommended by the manufacturer of the stabilizer so that the granite is uniformly hardened and the particles bound tightly together. Decomposed Granite areas shall be uniformly level, compacted and brought to smooth level finish. Decomposed granite areas which are crusted over and/or loosely compacted will be considered unacceptable by the Owner.

J. Turf Sod:

1. Sod shall be fresh and labeled in accordance with U. S. Department of Agriculture Rules and Regulations under the Federal Seed Act.
2. The turf shall be 'Celebration' hybrid Bermuda grass sod as supplied by AG Sod (800) 800-8483, or equal.

K. Other Materials:

1. Materials not specifically indicated, but necessary for proper execution of the work, shall be of first quality as selected by the Contractor subject to approval of Landscape Architect.
2. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at the site.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the area and conditions under which the work in this section is to be performed. Correct conditions detrimental to the timely and proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 ROUGH GRADING/SOIL COMPACTION

- A. Rough grading has been performed by others to the extent of establishing drainage patterns. The Contractor is responsible for placement of topsoil and rough grading required to ensure positive drainage in all turf and planting areas. Rough grading shall accommodate the addition of soil amendments in anticipation of proposed finish grades.
- B. During the course of earth work required in the project, compaction of soil in the turf and planting areas will exceed an acceptable density. The Landscape Contractor is required to cross rip and cultivate (break up large clumps and clods) the soil within

these areas so the soil is loose and friable. Ripping shall be to a depth of twelve inches (12") and shall be accomplished by approved means and methods as directed by the Owner. The Landscape Contractor shall review the completed ripping operation with the Landscape Architect to determine compliance. The Contractor shall provide additional work as directed by the after review.

- C. Do not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in air or that clods will not break readily. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and planting. Maintain within 2 percent above or below optimum moisture content for soil type present at all times during the work.
- D. The soil shall be cleared of all construction materials, concrete, stones, rocks, roots, wire, sticks, foreign material and similar objects larger than one half inch (1/2") in length.
- E. Spread approved type topsoil over accepted subgrade prior to incorporating amendments. Add topsoil where needed to bring grade to required elevation as referenced on the plans and specifications.

3.3 SOIL PREPARATION

- A. Throughout the entire project duration and before commencement of any soil preparation, all existing grasses and weeds on the site shall be killed by application of herbicide. All dead vegetation shall be removed from the site and disposed of in a lawful manner. The Contractor shall use and apply all weed control chemicals in accordance with the manufacturer's recommendations and all local codes and ordinances. The chemicals applied shall be done by a licensed applicator.
- B. Amend soil in the turf and planting areas per the following:
 - 1. Turf and Planting Area
 - a. Apply "Harvest Premium" at a rate of two (2) tons (4,000 pounds) per 1,000 square feet. Incorporate into soil to a depth of six inches (6") prior to finish grading.
 - b. Super Cal 75 gypsum shall be applied at a rate of 200 pounds per 1,000 square feet. Incorporate into soil to a depth of six inches (6") prior to finish grading.
 - c. Tri-C Humate shall be applied at a rate of thirty-five (35) pounds per 1,000 square feet. Incorporate into soil to a depth of six inches (6") prior to finish grade.
 - d. Tri-C Endo 120 Mycorrhizae shall be applied at a rate of one and one half (1 ½) pounds per 1,000 square feet. Incorporate into soil to a depth of six inches (6") prior to finish grading.
 - e. Pre-plant fertilizer shall be applied at a rate of five (5) pounds per 1,000 square feet. Apply to turf bed only prior to installing sod and after fine grade is accepted.
 - f. Quantum Light and Quantum Revive shall be applied at a rate of (1)

gallon per acre for each product. Apply after installing sod and shrubs / ground cover in all turf and planting areas.

- g. Soil Sulfur shall be applied at a rate of fifty (50) pounds per acre. Incorporate into soil to a depth of six inches (6") prior to finish grading.
 - h. Ferrous Sulfate 20% shall be applied at a rate of one hundred (100) pounds per acre. Incorporate into soil to a depth of six inches (6") prior to finish grading.
 - i. Manganese Sulfate 31% shall be applied at a rate of fifty (50) pounds per acre. Incorporate into soil to a depth of six inches (6") prior to finish grading.
- C. Planting pits, prior to planting trees and shrubs mix 50% native soil and 50% "Harvest Premium" as backfill mix.
- D. Pre blended soil amendments will not be accepted. The Contractor shall provide soil amendments in individual containers delivered to the site separately and identified by the manufacturer's product label.

3.4 FINE GRADING

- A. Upon completion of soil preparation, grade all planting and turf areas to smooth and even slope reestablishing drainage patterns. Grading shall eliminate all humps and hollows and promote positive drainage in all planting and turf areas.
- B. Tolerance of grade differential shall be plus or minus 0.05 foot from existing elevation. The Contractor shall water test all turf and planting areas after the grading operations are completed in the presence of the Landscape Architect. The water test shall consist of applying water to the turf and planting areas to the point where water runs over the soil to show the drainage pattern. Make all corrections to the grading as required by the Landscape Architect and certify that fine grading has re-established drainage patterns. Submit written certification of grade to the Landscape Architect. Certification shall be approved in writing by the Landscape Architect prior to proceeding with planting.
- C. During the finish grading process no relative compaction of the soil in turf and planting areas shall exceed 85% relative density. The reserves the right to require the Contractor to test for over compaction. The first test will be paid for by the Owner, all subsequent testing will be paid for by the Contractor.
- D. Finish grades shall be one half inch (½") for turf areas, and two inches (2") for planting areas, below all walks and curbs.

3.5 WEED CONTROL

- A. The Contractor shall treat all proposed turf and planting areas with a post emergent contact systemic herbicide weed killer at manufacturer's approved rates prior to any commencement of work at the site. Desiccated and dead weed growth shall then be removed from the entire project site by scraping the vegetation growth off of the existing dirt. Dispose of removed vegetation matter lawfully. Disking in of vegetative material is not acceptable.
- B. Weed eradication shall be ongoing from first day of project work, throughout the course of the project life and continue until final acceptance of the entire project. The Contractor shall apply a post-emergent systemic herbicide contact weed killer to eradicate all weeds throughout the project life up to and throughout the 90 day maintenance period for all areas of the project site. This includes but is not necessarily limited to open dirt areas, parking lots, ponding basin, concrete paving areas, etc. At no time will weeds be allowed to become established. Contractor shall provide all weed control operations as directed by the Owner.

3.6 PLANTING

- A. Planting Procedures
 1. Planting shall be performed by workmen familiar with planting procedures and under the supervision of a qualified foreman. The planting foreman shall be on the job site at all times when planting is in progress.
 2. Planting operations shall not occur under unfavorable weather conditions.
 3. Large trees shall be planted first. Shrub planting shall be completed before groundcover is planted.
 4. Proceed and complete the landscape work as rapidly as portions of the site become available, working within the seasonal limitations for each kind of landscape work required.
 5. Cooperate with other contractors and trades working in and adjacent to the landscape work areas. Examine drawings which show the development of the entire site and become familiar with the scope of other work required.
- B. Planting Preparation and Operations
 1. Planting material shall be provided with adequate protection of root systems and balls from drying winds and sun. Do not bend or bind trees or shrubs in such a manner as to damage bark, break or destroy natural shape. Provide protective covering during delivery.
 2. Deliver trees and shrubs after preparations for planting have been completed, and plant immediately. If planting is delayed more than six (6) hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage and keep roots moist. Do not remove container grown stock from containers until planting time.
 3. All planting areas shall be smooth and even. Finish grades shall be established as indicated on the plans. Approval of shall be secured before digging of holes.
 4. Place all trees and shrubs in locations shown on the planting plan and obtain written field approval of the before planting or digging planting pits. Inform the seven (7) days prior to placing the plants.

5. Carefully remove all canned stock from containers with tin snips or approved cutter. After removing plant from container, scarify the sides of the rootball to a depth of 1 inch at four to six equally spaced locations around the perimeter of the ball or at 12 inch intervals on sides of boxed materials. Cut and remove circling roots over 3/8 inch diameter.
6. Excavate holes of circular outline with vertical sides for all plants. The vertical sides and bottom of the holes shall be thoroughly scarified to promote union of backfill with existing soils. All trees shall be installed with drainage holes. The drainage hole shall be drilled with a twenty-four inch (24") diameter auger penetrating soil layers to sand or to a minimum depth of six (6) feet but in no case further than ten (10) feet. Precautions shall be exercised to avoid smooth sides on the holes. Offset augured hole eighteen inches (18") from the center of the planned tree location to avoid settling of tree after planting.
7. The Contractor shall test plant holes for drainage by flooding with water. If the water does not drain out within two (2) hours, excavating shall be carried down as required to achieve such drainage by breaking through the hardpan layer. In no case further than ten feet (10').
8. Tree and shrub holes shall be at least twice the width and depth of the plant container.
9. Set each plant in the center of the hole, plumb and straight. Set the crown of the plant at one inch (1") above finish grade (after settling). When ½ of the backfill mix has been placed, tamp-in, insert fertilizer and allow no air pockets as remainder of backfill is added.
10. Compact soil around the rootball of all plants and water in thoroughly.
11. Excess soil from plant holes shall be cultivated and raked to a smooth outline.
12. Shrubs and groundcovers shall be installed in relation to walks and paving to allow for future growth without obstructing traffic.
13. All plants shall be set in watering basin which shall be four feet (4') in diameter and three inches (3") deep for trees and two feet (2') in diameter and three inches (3") deep for shrubs and vines. Remove watering basins at end of maintenance.
14. Ground cover plants shall be planted at the spacing noted on the drawings in a triangular pattern. Not more than one hour shall elapse from the time any groundcover plant is planted until it is watered.
15. Upon completion of planting, the Landscape Contractor shall topdress the entire planting area with three inch (3") mulch and treat area with pre-emergent at a rate recommended by the manufacturer. Contractor shall coordinate application with the Landscape Architect and provide certificates of application to Landscape Architect. Provide one final application of pre-emergent seven (7) days prior to final acceptance.

C. Pruning

1. Prune plants in accordance with established horticultural practice and only when necessary. Shearing of any plants will not be acceptable.

D. Tree Staking:

1. Trees shall be supported by three (3) tree stakes, unless otherwise noted.
2. Stake shall be set firmly in the ground on the northwest side of the plant, and

- equally space others around tree.
3. Trees shall be tied to upright stakes loosely with Tree Ties (see planting detail).
- E. Decomposed Granite Surfacing
1. Place decomposed granite after mixing in "Stabilizer" over compacted subgrade and filter fabric in areas designated on plans. Add light application of water to moisten material and roll to compact to 85% relative density. Provide smooth grade to drain.
- F. Turf
1. The area to be planted shall be finish graded to present a smooth and even surface free of humps and hollows and conforming to the grading plans. Immediately prior to planting, the surface of the area to be planted shall be sufficiently loose and friable to receive the turf.
 2. Sod Planting

Moisten prepared surface immediately prior to laying sod.
Lay sod same day as delivery to prevent deterioration.
Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum as in laying bricks. Do not stretch or overlap sod pieces.
Lay smooth. Place sod so that final grade will match adjacent areas. Water lightly the sodded areas immediately after installation.
After all sod is laid, roll sodded areas with 300 pound vibrating roller to provide good bond between sod and soil and to remove minor depressions and irregularities. Roller shall not leave any marks on sod.
Immediately following installation, the soil should be moistened as much as necessary to keep it squishy wet. Avoid traffic on the new sodded areas until after first mowing.
 3. After acceptance by the inspector of the planting operations, the Contractor shall apply water, by means of a gentle spray, to make all planted areas moist, but not flooded. The areas shall not be watered to the extent of saturating the soil and causing "flotation" or "flowing" of the top surface of the soil. After water has once been applied, no portion of the planted areas shall be allowed to dry out during the entire maintenance period. The Contractor shall be responsible to monitor the site and alter the watering times and frequencies to meet site conditions.

3.7 CLEAN-UP

- A. All areas shall be maintained in a neat and orderly condition at all times. All reasonable precautions shall be taken to avoid damage to existing planting and structures.
- B. Damaged areas shall be restored to their original condition.
- C. After the planting operations are completed, the Landscape Contractor shall remove

all trash, excess soil, tree protection barriers, empty containers or any other debris accumulated by the work from the site. All damage caused by the work shall be repaired at the Contractor's expense and the ground shall be left in a neat and orderly condition to the satisfaction of the Landscape Architect.

3.8 GENERAL INSPECTION

- A. A general inspection will be held upon conclusion of the planting operations, irrigation system installation and after clean-up has occurred. The Owner shall be informed in writing a minimum of seven (7) working days prior to the time the work is ready for inspection in order to arrange a suitable time and date for such inspection.
- B. At the time of inspection, Contractor shall have all planting areas free of weeds and neatly cultivated and top dressed with mulch. All plant basins shall be in good repair. All trees shall be properly staked.
- C. Work requiring corrective action or replacement in the judgment of the Owner shall be performed within five (5) days after the inspection. Corrective work and materials replacement shall be in accordance with the drawings and specifications and shall be made by the Contractor at no cost to the Owner. A subsequent inspection shall then be arranged.

If, after the inspection, the Owner is of the opinion that all the work has been performed as per drawings and specifications, the Contractor will be given written notice of substantial completion.

3.9 MAINTENANCE

- A. The Contractor shall continuously maintain all areas included in the contract during the progress of the work, through the establishment period and until final acceptance of the work.

Maintenance work includes monitoring the site to control all watering, replanting, fertilizing, mulching, cultivating and mowing necessary to bring the planted areas to a healthy growing condition, and any additional work needed to keep the areas neat, edged and attractive. Any date when the Contractor fails to adequately water, replace unsuitable planted areas and other work determined to be necessary by the Owner, will NOT be credited as part of the Maintenance Period.

- B. The maintenance period shall commence following the first mowing of the turf and continues for a minimum period of ninety (90) calendar days as specified in these Specifications. No additional payment will be made for additional time necessary for maintenance and plant establishment required by the Owner.

The first mowing of turf shall not commence until the grass is generally at least one and one half inches (1-1/2") in height. For the first mowing and all subsequent mowings for the turf, the mower shall be set to cut at a height of one inch (1"). The turf shall be maintained by mowing and edging at least once every seven (7) calendar days after the initial mowing. The Contractor shall mow the site a minimum of ten (10) times. The turf shall be mowed and edged prior to final inspection.

- C. Between the fifteenth (15th) day and the twentieth (20th) day of the maintenance period the Contractor shall replant the spots or areas in which normal growth of the turf is not evident. The Contractor shall do the following: replant all spots or areas where normal growth is not evident; remove all rocks or other debris that would constitute a hindrance to mowing; repair all damaged done by his operations; fill all depressions and eroded channels with sufficient sandy loam top soil to raise to proper grade, compact lightly and replant the filled areas; and roll all planted and replanted areas with a one hundred twenty-five (125) pound weight roller to compact the soil around the seed and to provide a smooth and even mowing surface.
- D. During the progress of the maintenance period, the Contractor and the Owner shall conduct inspections at no less than 30 day intervals to determine that ongoing maintenance activities have been conducted by the Contractor. If in the opinion of the Owner, ongoing maintenance has not been conducted by the Contractor in a satisfactory manner the maintenance period shall be suspended. The Contractor shall provide remedial work as directed by the Owner to correct the found deficiencies and schedule another inspection. If after the reinspection the work is deemed acceptable the maintenance period shall resume.
- E. The Contractor shall fertilize the planted areas every three weeks with (15-15-15) fertilizer with minors at a rate of 5 lbs. / 1,000 sq. ft. The Contractor shall continue the fertilizer application until the planted area is accepted.

At no time will broadleaf and annual weeds be allowed to become established in the planting areas. At the earliest time possible the Contractor shall eradicate all weeds in the planting area by application of herbicides and/or mechanical or hand labor means. The Contractor shall not proceed with any weed eradication without the written consent of the Owner.

- F. A final inspection of the turf and planting areas shall be made by the Owner in the presence of the Contractor at the end of the ninety (90) day maintenance period to determine if the planted areas are well established and healthy throughout the entire site. If the areas are determined by the Owner as being unacceptable, the maintenance period will be extended to such time as the areas are brought up to the acceptable level.
- G. All trees, shrubs, ground cover shall be kept at a optimum growing condition by watering, weeding, replanting, fertilizing, cultivating, tree stake repair, spraying for diseases and insects, replace dead or dying materials, pruning as directed, maintaining proper grades of plants, and providing any other reasonable operations of maintenance and protection required for successful completion of the project.
- H. The Contractor shall be responsible to replace all loss of plants due to theft, vandalism or any other causes till final acceptance of the work by the Owner.

3.10 FINAL ACCEPTANCE

- A. Final inspection will be made at the end of the maintenance period, provided all

deficiencies brought out during that time have been corrected. If these deficiencies have not been corrected by the end of the stated maintenance period, the Contractor shall continue to maintain the project at his own expense beyond the specified time. When all deficiencies have been corrected, the final inspection will be held with the Project Inspector, and Contractor.

- B. If, after the final inspection, the owner is of the opinion that the work is acceptable, the Contractor will be given written acceptance of the project.

3.11 WARRANTY AND REPLACEMENT

- A. All trees and plants provided under this Contract shall be in good, healthy and flourishing condition one growing year from the date of final acceptance. If deemed necessary for replacements; Quality, species and size of replacements to be determined by the Landscape Architect.
- B. Except for loss beyond control of the Landscape Contractor, replacement of trees and plants of comparable quality and size shall be made by the Landscape Contractor. Replacement trees and plants shall be installed and guaranteed as specified for original planting.
- C. The Landscape Contractor shall be held responsible for repair of damages resulting from the defects, materials equipment or workmanship during the execution of his contract.
- D. All trees, shrubs and groundcover shall be guaranteed for a period of one calendar year after acceptance by the Architect.

END OF SECTION

SECTION 329400
PLANTING 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. Wall post system for climbing plants.
- B. Related Sections:
 - 1. Division 05 Section "Metal Fabrications" for trellis structure to receive climbing plant material.
 - 2. Division 32 Section "Planting" for climbing plant material.

1.3 SUBMITTALS

- A. See Section 01 33 00 "Submittal Procedures" for overall submittal procedures.
- B. Product Data: For each type of product indicated. Include all required accessories to complete wall post system.
- C. Shop Drawings: Include elevations and full-scale layout of wall post system. Show mounting methods, mounting heights, layout, spacing, accessories, and installation details.
- D. Operation and Maintenance Data: For wall post system to include in operation and maintenance manuals.
- E. Qualification Data: For manufacturer and Installer.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain wall post system from a single source and from a single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Drawings and Specifications are based on the following:

1. Green Blue Urban, Limited; 90 Series Spacer System
 - a. Subject to compliance with requirements, provide product indicated or a comparable product subject to Request for Substitution.

2.2 WALL POST SYSTEM

A. General: Surface-mounted post system for climbing plants, of type and layout indicated.

1. Spacer: 90 Series Spacer System with lockable base plate.
 - a. Provide all-purpose dowel with hanger bolt M10 or similar mount for steel applications.
2. Cable: Stainless steel cable Ø 4 mm
3. Cable Tensioner: Stainless steel; Model #: 210.4.M6x60
 - a. Provide one tensioner per cable end.
4. Rod: Stainless Steel rod Ø 6 mm
5. Connectors:
 - a. Stainless steel connectors for 4 mm cables
 - b. Stainless steel connectors for 4 mm cables with 6 mm rods
6. Layout: As indicated on Drawings.
7. Mounting Distance from wall: 8cm minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall post system and accessories in accordance with manufacturer's written installation instructions and as indicated on the Drawings.

END OF SECTION

SECTION 331000 - WATER DISTRIBUTION

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. Pipe and fittings for water piping.
 - 2. Valves and valve boxes.
 - 3. Fire Hydrant.
 - 4. Accessories.

- B. Related Sections:

- 1. Section 312000 "Earth Moving" for Trenching & Backfilling.

1.3 REFERENCES

- A. 2019 California Plumbing Code
- B. City of Clovis Standard Specifications dated October 1, 2012, Section 66 Potable Water Distribution Facilities
- C. ASTM Test Method D1557.
- D. ANSI/ASTM D2466 - Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.
- E. ANSI/AWWA C110 - Ductile Iron and Grey-Iron Fittings
- F. AWWA/ANSI C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe
- G. ANSI/AWWA C150 - Ductile-Iron Pipe
- H. ANSI/AWWA C509 - Gate Valves
- I. ANSI/AWWA C900 - Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.
- J. ASTM D1785 - Polyvinyl Chloride (PVC) Plastic Pipe, Schedule 40.

- K. ASTM D2855 - Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Pipe and Fittings.
- L. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

1.4 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Project Record Documents: Submit under provisions of Division 01.
 - 1. Accurately record actual locations of piping mains, valves, connections, and appurtenances.
 - 2. Identify and describe discovery of uncharted utilities, or utilities found at locations different than indicated on plans.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with product manufacturer's recommendations and these Contract Documents.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle all products required.

PART 2 - PRODUCTS

2.1 WATER PIPE

- A. Ductile Iron Pipe:
 - 1. Uses:
 - a. Iron pipe larger than 3 inches in diameter, above ground
 - b. Underground pipe with less than City Standard depth for PVC pipe as specified in the plans
 - 1) less than 3' cover for 6" or smaller diameter pipe
 - 2) less than 3.5 cover for 8" diameter pipe
 - 2. Pipe: ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, thickness Class 50,

with cement - mortar lining and seal coating per ANSI/AWWA C104/A21.4.

3. Joints: Typically, pipes shall have Push-on Type Joints per AWWA/ANSI C111/A21.11. Pipes shall have Flanged Joints per AWWA/ANSI C110/A21.10 where specified on plans.
4. Fittings: ANSI/AWWA C110/A21.10, ductile iron, Class 350 with standard asphaltic coating on exterior and with cement - mortar lining and seal coating on the interior per ANSI/AWWA C104/A21.4

B. PVC Schedule 80 Pipe:

1. Uses: for pipe 3" and smaller, underground:
2. Pipe: ASTM D1785, Schedule 80.
3. Joints: ASTM D2855, solvent weld.
4. Fittings: ANSI/ASTM D2467, Schedule 80 PVC

C. PVC C900 Pipe:

1. Uses: for pipe 4" and larger, underground:
2. Pipe: ANSI/AWWA C900-16 Class 235 DR18
3. Joints: ASTM D3139 integral bell and spigot gasketed joints
4. Fittings: ANSI/AWWA C110, ductile iron Class 350
5. Krausz USA Hymax 2 Flange Adaptor or approved equal
6. Krausz USA Hymax 2 Wide-Range Coupling or approved equal

2.2 GATE VALVES

- A. Gate Valves: ANSI/AWWA C509, Mueller Co. or Approved Equal, Iron body, bronze mounted, non-rising stem with "O" ring seal above and below the thrust collar, nut operated, turning left (counterclockwise) to open, flanged.
- B. Valve Box: Precast Reinforced Concrete. Cast iron lid marked "Water". Christy G5 or approved equal, per City of Clovis Standard W-1.
- C. Concrete Collar per City of Clovis Standard W-1.

2.3 FIRE HYDRANT

- A. Model per City Approved Hydrants per City of Clovis Standard W-2A
- B. Hydrant Assembly shall include Hydrant, Concrete Pad, Break off Check Valve, Extension,

Bury, Thrust Blocks, Gate Valve, Valve Box, Piping, Tee, Tracer Wire and all necessary fittings per City of Clovis Standard W-2A

2.4 ACCESSORIES

- A. Thrust Blocks per City of Clovis Standard Drawing W-15.
- B. Solvent Cement and Primer for PVC Pipe and Fittings: Per ASTM F656 and ASTM D2564.
- C. Blow-off per City of Clovis Standard Drawing W-13.
- D. Reduced pressure backflow preventors per City of Clovis Standard Drawing W-18.
- E. Fire main and appurtenances per the detailed drawings and per the City of Clovis Fire Department Standards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions. All plot dimensions are approximate. Before proceeding with any work, carefully check and verify all dimensions and report any variations to the Inspector.
- B. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. Carefully investigate the structural and finished conditions affecting all work, and plan 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 water systems, planting, and architectural features will be minimized. Water mains and Fire Hydrants locations are not diagrammatic and shall be installed in the locations shown on plans.
- C. Do not install the facilities as indicated on the drawings when it is obvious in the field that unknown obstructions might not have been considered in the engineering. Such obstructions or differences should be brought to the attention of the Civil Engineer.

3.2 PREPARATION

- A. Prepare for pipe installation by assembling all needed materials.
- B. Cover all PVC pipe during storage, in accordance with manufacture's recommendation, duration not to exceed manufacture's recommendation.
- C. Remove a portion of existing water main as shown on plans. This work shall be completed in accordance with these special provisions and the City of Clovis Standard Specifications, Section 66 "Potable Water Distribution Facilities", the California Department of Public Health (DPH) drinking water regulations and Occupational Safety and Health Administration (OSHA) worker protection rules (Title 8, § 8CCR1529). The work consists of abandoning existing asbestos cement pipes, size as noted, at the locations as shown on Plans and as directed by the Engineer,

complete and in place. The work includes, but is not limited to, saw-cutting, excavation, removal, disposal and/or salvage of existing unnecessary water facilities, valves, tees, crosses, adapters fittings and thrust blocks, installation of couplers, and all necessary appurtenances to complete the connection, and all applicable certifications.

3.3 BEDDING

- A. Excavate trench, pit or hole in accordance with Section 312000 “Earth Moving” and City of Clovis Standard ST-20.
- B. Backfill in accordance with Section 312000 “Earth Moving” and City of Clovis Standard ST-20.
- C. Maintain optimum moisture content of bedding material to attain required compaction density. See City of Clovis Standard ST-20.

3.4 INSTALLATION - PIPE AND FITTINGS

- A. Install pipe at locations and depths indicated on plans.
- B. Install pipe, fittings, and associated materials in accordance with manufacturers recommendations and City of Clovis Standards.
- C. Route pipe in straight line, whenever possible.
- D. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- E. Form and place concrete for thrust blocks at each elbow, tee, angle or other significant change of direction in loose-joint pipe, per City Standard.
- F. Establish elevations of buried piping to ensure not less than the following covers except at connections to existing lines, which may be shallower or deeper, or where shown otherwise on plans. The following list of minimum covers shall be used unless otherwise specified on the plans.
 - 1. 3.5 feet of cover minimum over 8” and 10” water main in public Right-of-Way and looping through the site.
 - 2. 3.0 feet of cover minimum over 6” water pipe and under vehicular paving.
 - 3. 3.0 feet of cover minimum when vehicular traffic is not a concern.
- G. When two water pipes are to be installed in same trench,
 - 1. For distribution mains maintain 3’ horizontal clearance between pipes.
 - 2. For services maintain 2’ horizontal clearance between pipes.
- H. Backfill in accordance with Section 312000 “Earth Moving” and City of Clovis Standard ST-20.

3.5 INSTALLATION - VALVES

- A. Set valves on solid bearing.
- B. Where valves are installed below finish surface grade, center and plumb valve box and any necessary extensions over valve. Set box cover flush with finished grade.
- C. Pour concrete collar around top of valve box per City Standard.
- D. Furnish and install valves and valve boxes in addition to those shown on plans as required for isolation of lines for construction and disinfection, while minimizing disruption of service to buildings, at no additional cost to Owner.
- E. For valve box extensions only SD-35 or C900 Pipe shall be used per City Standard. Raise valve boxes through the asphalt concrete pavement after placement of the pavement.

3.6 INSTALLATION - THREADED CONNECTIONS

- A. Assemble all plastic and galvanized steel threaded pipe and fittings using an approved Teflon tape applied to the male threads only. A minimum of two (2) wraps and a maximum of three (3) wraps of an approved Teflon tape will be required.
- B. At all plastic (PVC) pipe connections, work the ductile iron connections first. Connections shall always be plastic into steel, never steel into plastic.

3.7 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect all domestic water piping systems in accordance with AWWA Standard C601, "AWWA Standard for Disinfecting Water Mains", and in accordance with the City of Clovis Standard Specifications Section 66. Disinfection process shall be witnessed by a representative of the City of Clovis. The City of Clovis will complete all bacteria testing and witness all decontamination procedures per City of Clovis Standard Specifications Section 66. Call 48 hours in advance for scheduling.

3.8 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Division 01 General Requirements Sections.
- B. Compaction testing will be performed in accordance with ASTM Test Method D1557. If compaction tests indicate Work does not meet specified requirements, recompact and retest at no additional cost to Owner. All retesting will be at contractor's expense by a City of Clovis contracted firm.
- C. If tests indicate that Work does not meet specified requirements, remove work, replace and retest at no additional cost to Owner. All retesting will be at contractor's expense by a City of Clovis contracted firm.

END OF SECTION 331000

SECTION 333000 - SANITARY SEWERAGE

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. Furnish and install site sanitary sewer collection systems and associated accessory items as shown on the Drawings and as specified herein. Items include, but are not necessarily limited to, the following:
 - 2. Sanitary Sewer Pipelines and Services.

- B. Related Sections:

- 1. Section 312000 "Earth Moving" for Trenching & Backfilling.

1.3 REFERENCES

- A. 2019 California Plumbing Code
- B. City of Clovis Standard Specifications dated October 1, 2012, Section 64
- C. American Water Works Association (AWWA).
- D. American Society for Testing and Materials (ASTM):
- E. ASTM D3034 - Polyvinyl Chloride (PVC) Sewer pipe.
- F. City of Clovis Standards S-2, and S-5

1.4 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
 - 1. Submit manufacturer's data and/or fabrication drawings for all pipes, and appurtenances installed under this Section. No items shall be incorporated into the work until submittals are approved by the Civil Engineer.

1.5 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Safety Regulations: Work shall comply with all Federal, State and Municipal regulations regarding safety, including the requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleanout Boxes shall be precast reinforced concrete and cast iron lid marked for sewer service. Christy G3 or approved equal.
- B. Sanitary sewer pipelines shall be polyvinyl chloride (PVC) pipe for sanitary sewers conforming to ASTM Designation: 3034, SDR35, gasketed.
- C. Sanitary sewer manholes shall be per City of Clovis Standards S-2 and S-5.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions. All plot dimensions are approximate. Before proceeding with any work, carefully check and verify all dimensions and report any variations to the Inspector.
- B. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. Carefully investigate the structural and finished conditions affecting all work, and plan 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 water systems, planting, and architectural features will be minimized.

3.2 TRENCH EXCAVATION

- A. Trench excavation and backfilling shall be in accordance with Section 312000 "Earth Moving" and City of Clovis Standard ST-20.

3.3 PIPE INSTALLATION

- A. Pipe Laying: Sewer pipe shall be laid in strict conformity to the prescribed line and grade per City of Clovis Standard Specification Section 64. Alignment and grade shall be set and checked by laser. In case any discrepancy exists, the work shall be stopped and the discrepancy immediately reported to the Civil Engineer. In addition, when requested by the Architect, a string line shall be used in the bottom of the trench to insure a straight alignment of the sewer pipe between manholes.

1. Pipe laying shall proceed upgrade with the bell ends of bell and spigot pipe placed upstream. Each section of pipe shall be laid to line and grade as herein specified and in such a manner as to form a watertight, concentric joint with the adjoining pipe. The interior of the pipe shall be cleared of all dirt and debris and excess joint sealing material as the work progresses. Pipe shall not be laid when the condition of the trench or weather is unsuitable. All open ends of pipe and fittings shall be adequately and securely closed whenever the work is discontinued for more than one-half hour. If pipe with elliptical or quadrant reinforcement is used, care shall be taken to properly orient the axis.
 2. Where plain end vitrified clay pipe with the compression coupling is installed, the contractor shall tighten the compression bands as pipe lying process. The first length of pipe laid on any run, except where a connection is made to an existing line, shall be anchored securely to prevent movement when each succeeding length is pushed home. After each compression band is torqued, the Contractor shall replace and tamp any bedding material that may have been displaced under the pipe and particularly under the coupler before proceeding with the initial backfill.
 3. All joint surfaces shall be cleaned before joints are made.
- B. Sewer Systems Plugs: Temporary plugs shall be installed on all sewer projects at points of connection to existing facilities according to City Standards. These plugs shall remain in place until completion of the balling and flushing operation. The plugs, intended to prevent water from the balling and flushing operation, drainage, or any other condition from entering the existing system, shall be installed or removed in the presence of and under the direct supervision of the Engineer. Until the system has been pumped clear of accumulated water, the plugs shall not be removed. This water must not be allowed to enter adjacent sewer or drainage systems.
- C. Internal Inspection: Upon completion of construction and prior to final inspection, the Contractor shall clean the entire new pipeline of all dirt and debris. Any dirt or debris in previously existing pipes or ditches in the area, which in the opinion of the Architect resulted from the new installation, shall also be removed by the Contractor. Sewer pipes shall be cleaned by the controlled balling method. Temporary plugs shall be installed and maintained during cleaning operations at points of connection to existing facilities to prevent water, dirt, and debris from entering the existing facility. Temporary plugs for sewer systems shall also conform to Subsection B, above. Water from the drainage system operations shall be routed through a suitable trap to collect any dirt and debris prior to discharging into any downstream facility. The Contractor shall notify the Architect immediately after completion of the pipe cleaning operations.
1. As soon as possible after the completion of the pipe cleaning, and prior to final acceptance, the Architect may make a visual internal inspection of the new pipeline either manually or with television equipment.

3.4 CLEANOUTS

- A. Install cleanouts at locations shown on the Plans. Locate cleanouts in accessible locations and bring flush to finished surface per plan detail.

3.5 TESTING OF SANITARY SEWERS

- A. After cleaning, each section of sewer constructed shall be tested in accordance with acceptable "Low Pressure Air Test for Sanitary Sewers" methods such as presented in the Journal of Sanitary Engineering, Division ASCE, April 1964.

3.6 BACKFILLING AND ADJUSTMENT TO GRADE

- A. Place and compact backfill per Section 312000 "Earth Moving" and per the City of Clovis Standard ST-20.
- B. Conform finished surface to the lines, grades and cross-sections shown on the plans, or as otherwise directed by the Inspector.
- C. In areas to receive paving or a significant thickness of sealing material, temporarily set manhole frame and cover below finish grade, then return after final surfacing and/or pavement sealing and bring manhole frame and cover to final grade, as shown on the plans, per City of Clovis Standard Drawings S-2 and S-5.
- D. Adjustment of sewer cleanouts to finish grade shall be as per the Drawings.

3.7 CLEAN-UP

- A. Remove from the site all rubbish, debris, etc. resulting from Work in this Section. The clean up shall include the replacement and repair of any damaged or disturbed property.

END OF SECTION

SECTION 334000 – ON-SITE STORM DRAINAGE FACILITIES

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. For public storm drainage facilities within the Public Right-of-Way and Easements that are part of Fresno Metropolitan Flood Control District's Contract 4D-B, see Appendix #2 for the specifications for the associated work as shown on the district's plans.

1.2 SUMMARY

- A. Section Includes:
 - 1. Locating existing utilities.
 - 2. Furnishing and installing storm drainage facilities, including pipe, manholes, and inlet structures.
- B. Related Sections:
 - 1. Section 033000 "Cast-in-Place Concrete"
 - 2. Section 312000 "Earth Moving" for Trenching & Backfilling.

1.3 DEFINITIONS

- A. Bedding: Fill placed under, around, beside and directly over pipe, prior to subsequent backfill operations.
- B. Utility: Any buried or above ground pipe, conduit, cable, associate device or appurtenances, or substructure pertaining thereto.

1.4 REFERENCES

- A. ASTM D3034 - Polyvinyl Chloride (PVC) Storm Drain pipe, gasketed.
- B. ANSI/ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- C. Type "A" Case I Storm Drain Manhole per Fresno Metropolitan Flood Control District Standards B-1 and B-7

1.5 SUBMITTALS

- A. Product Data: Provide data indicating pipe, structures, and accessories.

- B. Certificates of compliance for material.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install products supplied.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Storm drainage sewer pipeline shall be polyvinyl chloride (PVC) pipe for storm sewer conforming to ASTM designation 3034, SDR 35 for pipe 15" or less.
- B. Precast Reinforced Concrete Manhole Sections: Per ANSI/ASTM C478. Elliptical single line reinforcement is not allowed and as shown on detail drawing.
- C. Type "A" Case I Storm Drain Manhole per Fresno Metropolitan Flood Control District Standards
- D. ADA compliant storm drain inlet per U.S. Foundry 4131 Ring and 6001 Grate or approved equal.
- E. Storm drain inlet per plan details.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions. All plot dimensions are approximate. Before proceeding with any work, carefully check and verify all dimensions and report any variations to the Inspector.
- B. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, etc., which may be required. Carefully investigate the structural and finished conditions affecting all work, and plan 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 water systems, planting, and architectural features will be minimized.

3.2 PREPARATION

- A. Identify location of proposed storm drainage facilities to be constructed. Expose connection points to existing system.
- B. Locate, identify, and protect existing above and below grade utilities and structures from damage.
- C. Protect excavated areas from drainage inflow, and provide drainage to all excavated areas. Dewater existing drainage pipeline systems as necessary to accomplish the work.

3.3 TRENCH EXCAVATION

- A. Excavate trenches and pits per Section 312000 "Earth Moving" and per the City of Clovis Standard ST-20.
- B. Excavate trenches and pits to allow installation and construction of the storm drainage facilities to the alignment, grades, depths and cross-sections as indicated on the construction plans.
- C. Excavate trench to depth which is 4 inches below the outside bottom of the pipe barrel to be placed therein.
- D. Cut trenches just wide enough to allow the installation of the pipe and pipe bedding as indicated on the plans. Minimize trench width above the pipe.

3.4 INSTALLATION OF STORM DRAIN PIPE

- A. Install the pipe and fittings to the lines and grades shown on the construction plans.
- B. Install pipe and fittings in accordance with the manufacturer's recommendations, and these specifications.
- C. Unless otherwise approved by the Civil Engineer, lay all pipe upgrade from structure to structure, with bell or socket ends of pipe upgrade.
- D. Excavate suitable bell (or socket) holes in the bedding material, so that the bells do not bear on the subgrade or bedding. Provide uniform bearing of pipe barrel on bedding material.
- E. Ensure that all joints are properly "homed" and are watertight.

3.5 INSTALLATION OF STORM DRAINAGE STRUCTURES AND APPURTENANCES

- A. Install storm drainage structures as indicated on the construction plans, in accordance with the manufacturer's recommendations, and as specified herein.
- B. Key top of poured-in-place concrete bases for structures to receive the tongue of precast riser sections.
- C. Joint precast manhole and structure riser sections with a minimum thickness of 1/2 inch of mortar to make a watertight joint. Neatly point the inside and outside of the joint. Set sections plumb.

3.6 BACKFILLING TO GRADE

- A. Place and compact backfill per Section 312000 "Earth Moving" and per the City of Clovis Standard ST-20.
- B. Conform finished surface to the lines, grades and cross-sections shown on the plans, or as otherwise directed by the Inspector.
- C. In areas to receive paving or a significant thickness of sealing material, temporarily set manhole frame and cover below finish grade, then return after final surfacing and/or pavement sealing and bring manhole frame and cover to final grade, as shown on the plans.

3.7 TOLERANCES

A. Pipe laying tolerances:

1. Above grade: Not to exceed 1/4 inch above planned grade.
2. Below grade: Not to exceed 1/2 inch below planned grade.
3. Alignment: Not to exceed 2 inches from planned alignment, if gradual and regular over a distance of 20 feet.

B. Structure finish grade tolerance: Within 1/4 inch of planned grade, but must match adjacent improvements.

3.8 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed as required by authorities having jurisdiction.

END OF SECTION

APPENDIX No. 1

GEOTECHNICAL INVESTIGATION REPORT

**GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED CIVIC CENTER
3RD STREET & HUGHES AVENUE
CLOVIS, CALIFORNIA**

**PROJECT NO. 012-15087
OCTOBER 22, 2015**

Prepared for:

**MR. STEVE WHITE
CITY OF CLOVIS
1033 FIFTH STREET
CLOVIS, CALIFORNIA 93612**

Prepared by:

**KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
215 WEST DAKOTA AVENUE
CLOVIS, CALIFORNIA 93612
(559) 348-2200**



GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

October 22, 2015

KA Project No. 012-15087

Mr. Steve White
City of Clovis
1033 Fifth
Clovis, California 93612

RE: Geotechnical Engineering Investigation
Proposed Civic Center
3rd Street & Hughes Avenue
Clovis, California

Dear Mr. White:

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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October 22, 2015

KA Project No. 012-15087

**GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED CIVIC CENTER
3RD STREET & HUGHES AVENUE
CLOVIS, CALIFORNIA**

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed Civic Center to be located at 3rd Street near Hughes Avenue in Clovis, 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, excavation stability, soil cement reactivity, and pavement design.

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. Appendices B and C contain guides to earthwork and pavement 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 July 7, 2015 (KA Proposal No. P359-15), and included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.
- A field investigation consisting of drilling 12 borings to depths ranging from approximately 10 to 25 feet for evaluation of the subsurface conditions at the project site.
- 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

We understand that design of the proposed development is currently underway; structural load information and other final details pertaining to the structures are unavailable. On a preliminary basis, it is understood the development will include 3 new single-story structures. The buildings will range in size from approximately 8,766 square feet to 30,000 square feet. The structures will be supported on conventional foundations and concrete slab-on-grade. Foundation loads are anticipated to be light to moderate. On-site parking and landscaping is also planned for the development of the project.

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, SITE HISTORY AND SITE DESCRIPTION

The project site is irregular in shape and encompasses approximately 6 acres. The site is located just north of 3rd Street at Hughes Avenue in Clovis, California. Residential developments are located east of the site. The Clovis Trail trends north-south along the western portion of the site. The remainder of the site is predominately surrounded by commercial developments.

Site history was obtained by reviewing historical aerial photographs taken in 1998, 2006 and 2014. Review of the 1998 aerial photograph indicates that the project site was occupied by a warehouse building, residence, and several barns and sheds. Several trees were located throughout the site. Mounds of fill soil were located in the northern portion of the site. The remainder of the site was predominately vacant or used as a storage area for trucks, vehicles and trailers.

Review of the 2006 and 2014 aerial photographs indicate that the project site conditions appeared to be relatively similar to that noted in the 1998 aerial photograph.

Presently, the site is predominately vacant. The structures, equipment and vehicles noted in the previous aerial photographs had been removed. Several concrete slabs were still present at the site. Several chain link fences trended throughout the site. Several trees were still present throughout the site. Portions of the site were covered with a sparse weed growth and the surface soils had a loose consistency. The site is relatively level with no major changes in grade.

GEOLOGIC SETTING

The San Joaquin Valley, which includes the Clovis 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 Clovis area, they were derived from the Sierra Nevada.

The San Joaquin River is the principal river in the area. Alluvial fans formed by this river are the largest geomorphic features in the Clovis 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 Clovis area. The Owens Valley Fault Zone bounds the eastern edge of the Sierra Nevada block and contains both active and potentially active faults.

Portions of the Ortigalita, Calaveras, Hayward and Rinconada Faults, which are to the west, are considered potentially active. The San Andreas Fault is possibly the best known fault and is located about 60 to 70 miles to the west.

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.

Clovis residents could feel the affects of a large seismic event on one of the nearby active or potentially active fault zones. Clovis has experienced groundshaking from earthquakes in the historical past. According to the Five County Seismic Safety Element, groundshaking of VII intensity (Modified Mercalli Scale) was felt in Clovis from the 1872 Owens Valley Earthquake. This is the largest known earthquake event affecting the Clovis area.

Secondary hazards from earthquakes include rupture, seiche, landslides, liquefaction, and subsidence. Since there are no known faults within the immediate area, ground rupture from surface faulting should not be a potential problem. Seiche and landslides are not hazards in the area either. Liquefaction potential (sudden loss of shear strength in a saturated cohesionless soil) should be low since groundwater occurs below 90 feet. Lastly, deep subsidence problems may be low to moderate according to the conclusions of the Five County Seismic Safety Element. However, there are no known occurrences of structural or architectural damage due to deep subsidence in the Clovis area.

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling 12 borings to depths ranging from approximately 10 to 25 feet below existing site grade, using a truck-mounted drill rig. In addition, 3 bulk subgrade samples were obtained from the site for laboratory R-value testing. The approximate boring and bulk sample 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, consolidation potential, expansion potential, R-value, and moisture-density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils for buried concrete and metal. 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, portions of the site were covered with concrete slabs. Within areas not covered by the concrete slabs, the upper soils consisted of approximately ½ to 3½ feet of fill material. The fill material predominately consisted of silty sand. These soils contained varying amounts of gravel. 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 material had varying strength characteristics ranging from loosely placed to compacted.

Beneath the fill material, approximately 2 to 3 feet of loose to very dense silty sand was encountered. Some of these soils were weakly cemented in parts. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 12 blows per foot to greater than 50 blows per 6 inches. Dry densities ranged from 120 to 135 pcf. Representative soil samples consolidated approximately 1½ to 3½ percent under a 2 ksf load when saturated. Representative soil samples had angles of internal friction of 34 and 36 degrees.

Some of the soils below the fill material consisted of weakly cemented silty sand, locally referred to as "hardpan". These cemented soils can be generally characterized as relatively strong, slightly compressible, and have a low permeability. In some of the borings, the hardpan layer was conspicuously absent.

Below approximately 4 to 5 feet, predominately medium dense to very dense silty sand, sandy silt or clayey silty sand were encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 17 blows per foot to greater than 50

blows per 6 inches. Dry densities ranged from 98 to 133 pcf. A representative soil sample consolidated approximately 3 percent under a 2 ksf load when saturated. Some of these soils were weakly cemented in parts. These soils had slightly stronger strength characteristics than the upper soils and extended to the 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 not encountered.

Lenses and layers of very dense, weakly cemented silty sand, locally referred to as “hardpan” were encountered below 4 to 5 feet in several of the borings. These cemented soils can be generally characterized as relatively strong, slightly compressible, and have a low permeability. This cementation retards the free percolation of the surface water into the soil stratum below the hardpan frequently resulting in a temporary perched water table condition at or near the ground surface

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.

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 fill material, previous development, and existing development, appear to be conducive to the development of the project. Portions of the site are covered with concrete slabs. Within areas not covered by concrete, the upper soils consisted of approximately ½ to 3½ feet of fill material. The fill material predominately consisted of silty sand with varying amounts of gravel. 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 material had varying strength characteristics ranging from loosely placed to compacted. Therefore, it is recommended the fill material be removed so the native soils can be properly prepared. Preliminary testing indicates the fill material will be suitable for re-use as Engineered Fill, provided it is cleansed of excessive organics and debris. It is recommended that during construction, additional testing be performed on the fill material to verify the physical and index properties prior to reuse as Engineered Fill.

The site was previously occupied by several buildings. In addition, the site is presently surrounded by commercial and residential developments. Associated with these developments are buried structures such as utility lines, possible septic systems and potentially loosely backfilled excavations that may extend into the site. Any buried structures, including utilities or loosely backfilled excavations encountered during construction should be properly removed and the resulting excavations backfilled with Engineered Fill. 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. This compaction effort should stabilize the upper soils and locate any unsuitable or pliant areas not found during our field investigation.

Several trees are located throughout the site. In addition, several trees previously occupied the site. Tree removal operations should include roots greater than 1 inch in diameter. The resulting excavation should be cleaned to firm native ground and backfilled with Engineered Fill compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Lenses of cemented silty sand, locally referred to as hardpan, were encountered below approximately 4 to 5 feet in several of the borings. Hardpan is an excellent foundation-bearing material because of its apparent rock-like properties caused by particle cementation. However, this same cementation also retards the free percolation of the surface water into the soil stratum below the hardpan, frequently resulting in a temporary perched water table condition at or near the ground surface. This perched water condition has a substantial effect on the strength characteristics of the surface soils. As a mitigation measure, very positive drainage should be established around the proposed structures.

Sandy and gravelly soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavation. Shoring or sloping back trench sidewalls may be required within these sandy and gravelly soils.

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structure footings may be designed utilizing allowable bearing pressure of 2,500 pounds per square foot for dead-plus-live loads. Footings should have a minimum embedment of 18 inches.

Groundwater Influence on Structures/Construction

Based on our findings and historical records, it is not anticipated that groundwater will rise within the zone of structural influence or affect the construction of foundations and pavements for the project. However, 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.

Some structures in the Clovis area that are founded on hardpan have experienced standing water for extended periods of time in crawl spaces below wooden floors or within sunken floor slab areas. The sources of the water were natural precipitation and landscape irrigation, and consequently, wood floor and sunken floor slab construction in hardpan soils are discouraged.

Site Preparation

General site clearing should include removal of concrete; vegetation and existing utilities; and structures; including foundations; basement walls and floors; existing stockpiled soil; 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.

Portions of the site are covered with concrete slabs or pavement. Some of these may be underlain by aggregate base. Within areas not covered by concrete, the upper soils consisted of approximately 6 to 12 inches of very loose silty sand and gravel. These soils are disturbed, have low strength characteristics and are highly compressible when saturated. Beneath the concrete and loose surface soils, the upper soils consisted of approximately ½ to 3½ feet of fill material. The fill material predominately consisted of silty sand. These soils contained varying amounts of gravel. 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 material had varying strength characteristics ranging from loosely placed to compacted. Therefore, it is recommended the fill material be removed so the native soils can be properly prepared. Preliminary testing indicates the fill material will be suitable for re-use as Engineered Fill, provided it is cleansed of excessive organics and debris. It is recommended that during construction, additional testing be performed on the fill material to verify the physical and index properties prior to reuse as Engineered Fill.

Several structures surround the site. In addition, several structures previously occupied the site. 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. During grading operations the site should be investigated utilizing fully loaded earthmoving equipment to identify potential loosely backfilled excavations or buried structures. 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. 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.

Several trees previously occupied the site. In addition, several trees are still present at the site. Tree removal operations should include roots greater than 1 inch in diameter. The resulting excavation should be cleaned to firm native ground and backfilled with Engineered Fill compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Following stripping, fill and tree removal operations, and demolition activities, the exposed subgrade within the building pad areas should be excavated to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned as necessary, and recompactd 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. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Following stripping, fill and tree removal operations, and demolition activities, the exposed subgrade within the exterior flatwork and pavement areas should be excavated/scarified to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned as necessary, and recompactd to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

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.

Engineered Fill

The on-site, upper native soils and fill material are predominately silty sand and silty sand with varying amounts of gravel. These soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension.

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 material should be predominately non-expansive granular material with a plasticity index less than 10 and an expansion index less than 15. Imported Fill should be free from rocks and clods greater than 4 inches in diameter. All Imported Fill material should be submitted to the Soils Engineer for approval at least 48 hours prior to delivery at the site.

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned as necessary, and compacted to achieve at least 90 percent maximum density as based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required dry 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 2013 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 reduced and 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 shortly 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 excavation. 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 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 soil 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.

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 the undisturbed native soil or on Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	1,875 psf
Dead-Plus-Live Load	2,500 psf
Total Load, including wind or seismic loads	3,325 psf

As an alternative, the proposed structures may be supported on a shallow foundation system bearing a minimum of 2 feet of Engineered Fill. Spread and continuous footings supported on a minimum of 2 feet of Engineered Fill can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	3,000 psf
Dead-Plus-Live Load	4,000 psf
Total Load, including wind or seismic loads	5,325 psf

The footings should have a minimum 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 total settlement is not expected to exceed 1 inch. Differential settlement, should be less than ½ inch. Most of the settlement is expected to occur during construction, as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.4 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 350 pounds per cubic foot 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 ½ increase in the above value may be used for short duration, wind, or seismic loads. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

Floor Slabs and Exterior Flatwork

The exterior floors should be poured separately in order to act independently of the walls and foundation system. Exterior finish grades should be sloped a minimum of 2 percent away from all interior slab areas to preclude ponding of water adjacent to the structures. All fills required to bring the building pads to grade should be Engineered Fills.

It is recommended concrete slab-on-grade floors be underlain by a water vapor retarder. 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 38 pounds per square foot per foot of depth. Walls that are incapable of this deflection or are fully constrained against deflection may be designed for an equivalent fluid at-rest pressure of 58 pounds per square foot per foot of 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. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

During grading and backfill 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.

R-Value Test Results and Pavement Design

Three subgrade samples were obtained from the project site for R-Value testing at the locations shown on the attached site plan. The samples were tested in accordance with the State of California Materials Manual Test Designation 301. Results of the tests are as follows:

Sample	Depth	Description	R-Value at Equilibrium
1	12-24"	Silty Sand (SM)	57
2	12-24"	Silty Sand (SM)	59
3	12-24"	Silty Sand (SM)	57

The test results are moderate and indicate good subgrade support characteristics under dynamic traffic loads. The following table shows the recommended pavement sections for various traffic indices.

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade**
4.0	2.0"	4.0"	6.0"
4.5	2.5"	4.0"	6.0"
5.0	2.5"	4.0"	6.0"
5.5	3.0"	4.0"	6.0"
6.0	3.0"	4.0"	6.0"
6.5	3.5"	4.0"	6.0"
7.0	4.0"	4.0"	6.0"
7.5	4.0"	4.0"	6.0"

* 95% compaction based on ASTM Test Method D1557 or CAL 216

** 95% compaction based on ASTM Test Method D1557 or CAL 216

If traffic indices are not available, an estimated (typical value) index of 4.5 may be used for light automobile traffic and an index of 7.0 may be used for light truck traffic.

The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

PORTLAND CEMENT PAVEMENT

LIGHT DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
4.5	5.0"	--	6.0"

HEAVY DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
7.0	6.5"	--	6.0"

* 95% compaction based on ASTM Test Method D1557 or CAL 216

** 95% compaction based on ASTM Test Method D1557 or CAL 216

***Minimum compressive strength of 3000 psi

As indicated previously, fill material is located on the site. It is recommended that any uncertified fill material encountered within pavement areas be removed and/or recompacted. The fill material should be moisture-conditioned to near optimum moisture and recompacted to a minimum of 90 percent of

maximum density based on ASTM Test Method D1557. As an alternative, the Owner may elect not to recompact the existing fill within paved areas. However, the Owner should be aware that the paved areas may settle, which may require annual maintenance. At a minimum, it is recommended that the upper 12 inches of subgrade soil be moisture-conditioned as necessary and recompact to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Seismic Parameters – 2013 California Building Code

The Site Class per Section 1613 of the 2013 California Building Code (2013 CBC) and Table 20.3-1 of ASCE 7-10 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 2013 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Section 1613.3.2
Site Coefficient F_a	1.335	Table 1613.3.3 (1)
S_s	0.581	Section 1613.3.1
S_{MS}	0.776	Section 1613.3.3
S_{DS}	0.517	Section 1613.3.4
Site Coefficient F_v	1.915	Table 1613.3.3 (2)
S_1	0.242	Section 1613.3.1
S_{M1}	0.464	Section 1613.3.3
S_{D1}	0.310	Section 1613.3.4

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 and are below the maximum allowable values established by HUD/FHA and CBC. Therefore, no special design requirements are necessary to compensate for sulfate reactivity with the cement.

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.

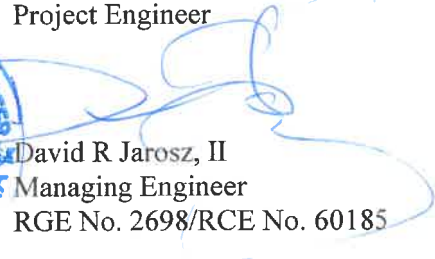
The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical 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.

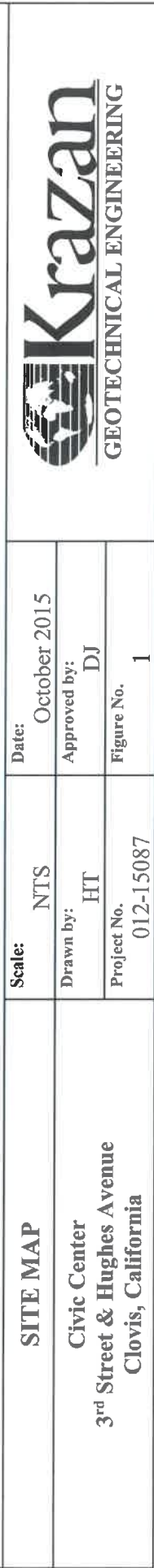


Steve Nelson
Project Engineer



David R Jarosz, II
Managing Engineer
RGE No. 2698/RCE No. 60185

SN/DRJ:ht



APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Twelve 4½-inch diameter 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 were performed at selected depths. This test represents the resistance to driving a 2½-inch diameter split barrel. 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. 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. R-value tests were completed for select bag samples obtained from the auger cuttings. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

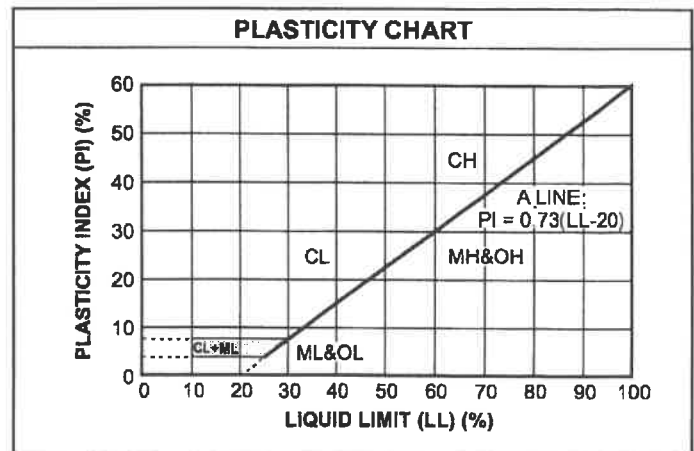
The logs of the exploratory borings and laboratory determinations are presented in this Appendix.

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
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
		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
		PT	Peat and other highly organic soils
	HIGHLY ORGANIC SOILS		
		PT	Peat and other highly organic soils
		PT	Peat and other highly organic soils

CONSISTENCY CLASSIFICATION	
Description	Blows per Foot
<i>Granular Soils</i>	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
<i>Cohesive Soils</i>	
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



Log of Boring B1

Project: Civic Center

Project No: 012-15087

Client: City of Clovis

Figure No.: A-1

Location: 3rd Street & Hughes Avenue, Clovis, CA

Logged By: R. Alexander

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
		GRAVELLY SILTY SAND (SM) FILL, fine- to coarse-grained; light brown											
2		SITLY SAND (SM) Loose, fine- to coarse-grained; light brown, damp, drills easily Medium dense below 1 foot	125.4	2.8		30							
4		SILTY SAND (SM) Medium dense, fine- to medium-grained; brown, damp, drills easily											
6		CLAYEY SILTY SAND (SM) Very dense, fine- to medium-grained, weakly cemented; brown, damp, drills hard	127.6	5.0		50+							
8		SANDY SILT (ML) Very dense, fine-grained; brown, damp, drills hard											
10			130.5	7.6		50+							
12													
14													
16		End of Borehole											
18													
20													

Drill Method: Solid Flight

Drill Date: 7-30-15

Drill Rig: CME 45B

Krazan and Associates

Hole Size: 4½ Inches

Driller: Brent Snyder

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B2

Project: Civic Center

Client: City of Clovis

Location: 3rd Street & Hughes Avenue, Clovis, CA

Depth to Water>

Initial: None

Project No: 012-15087

Figure No.: A-2

Logged By: R. Alexander

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
		GRAVELLY SILTY SAND (SM) FILL, fine- to coarse-grained; brown, drills easily											
2		SILTY SAND (SM) Medium dense, fine- to medium-grained; light brown, damp, drills firmly	133.3	4.1		45							
4		SILTY SAND (SM) Dense, fine- to medium-grained; brown, damp, drills firmly											
6		CLAYEY SILTY SAND (SM) Very dense, fine- to medium-grained, weakly cemented; brown, damp, drills hard	129.3	6.6		50+							
8		SANDY SILT (ML) Dense, fine-grained; brown, damp, drills hard											
10		End of Borehole											
12													
14													
16													
18													
20													

Drill Method: Solid Flight

Drill Rig: CME 45B

Driller: Brent Snyder

Krazan and Associates

Drill Date: 7-30-15

Hole Size: 4½ Inches

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B3

Project: Civic Center

Client: City of Clovis

Location: 3rd Street & Hughes Avenue, Clovis, CA

Depth to Water>

Initial: None

Project No: 012-15087

Figure No.: A-3

Logged By: R. Alexander

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
		GRAVELLY SILTY SAND (SM) FILL, fine- to coarse-grained; light brown, damp, drills easily											
2		SILTY SAND (SM) Dense, fine- to medium-grained; brown, damp, drills firmly	127.0	2.3		55							
4		SILTY SAND (SM) Very dense, fine- to medium-grained, weakly cemented; brown, damp, drills hard				50+							
6													
8		SANDY SILT (ML) Very dense, fine-grained; brown, damp, drills hard											
10			133.8	8.8		50+							
12													
14													
16		End of Borehole											
18													
20													

Drill Method: Solid Flight

Drill Rig: CME 45B

Driller: Brent Snyder

Krazan and Associates

Drill Date: 7-30-15

Hole Size: 4½ Inches

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B4

Project: Civic Center

Client: City of Clovis

Location: 3rd Street & Hughes Avenue, Clovis, CA

Depth to Water>

Initial: None

Project No: 012-15087

Figure No.: A-4

Logged By: R. Alexander

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
2		SILTY SAND (SM) FILL, fine- to coarse-grained; brown, damp, drills easily	131.8	9.7		15							
4		SILTY SAND (SM) Loose, fine- to medium-grained; brown, damp, drills easily	121.7	7.5		20							
6		SILTY SAND (SM) Medium dense, fine- to medium-grained; light brown, damp, drills easily											
8		SANDY SILT (ML) Very dense, fine-grained; brown, damp, drills hard											
10			130.9	11.5		50+							
12													
14													
16		End of Borehole											
18													
20													

Drill Method: Solid Flight

Drill Rig: CME 45B

Driller: Brent Snyder

Krazan and Associates

Drill Date: 7-30-15

Hole Size: 4½ Inches

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B5

Project: Civic Center

Client: City of Clovis

Location: 3rd Street & Hughes Avenue, Clovis, CA

Depth to Water>

Initial: None

Project No: 012-15087

Figure No.: A-5

Logged By: R. Alexander

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
0		SILTY SAND (SM) Very loose, fine- to coarse-grained; brown, damp, drills easily Loose below 1 foot											
2			124.2	5.7		12							
4		Medium dense below 4 feet											
6		Very dense below 5 feet	132.4	9.3		50+							
8													
10		SANDY SILT (ML) Very dense, fine- to medium-grained; brown, moist, drills easily	98.6	13.1		50+							
12													
14		SILTY SAND (SM) Very dense, fine- to medium-grained; brown, moist, drills firmly											
16		SILTY SAND/SANDY SILT (SM) Very dense, fine- to medium-grained; brown, moist, drills hard	127.6	11.4		50+							
18													
20													

Drill Method: Solid Flight

Drill Rig: CME 45B

Driller: Brent Snyder

Krazan and Associates

Drill Date: 9-18-15

Hole Size: 4½ Inches

Elevation: 20 Feet

Sheet: 1 of 1

Log of Boring B6

Project: Civic Center

Project No: 012-15087

Client: City of Clovis

Figure No.: A-6

Location: 3rd Street & Hughes Avenue, Clovis, CA

Logged By: R. Alexander

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.					
							20 40 60	10 20 30 40			
0		Ground Surface									
2		SILTY SAND (SM) FILL, fine- to coarse-grained; light brown, damp, drills easily									
4		SILTY SAND (SM) Medium dense, fine- to medium-grained; brown, damp, drills easily	126.3	2.8		27					
6		SILTY SAND (SM) Medium dense, medium-grained; reddish-brown, damp, drills firmly	123.6	4.6		40					
10		End of Borehole									
12											
14											
16											
18											
20											

Drill Method: Solid Flight

Drill Date: 9-18-15

Drill Rig: CME 45B

Krazan and Associates

Hole Size: 4½ Inches

Driller: Brent Snyder

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B7

Project: Civic Center

Client: City of Clovis

Location: 3rd Street & Hughes Avenue, Clovis, CA

Depth to Water>

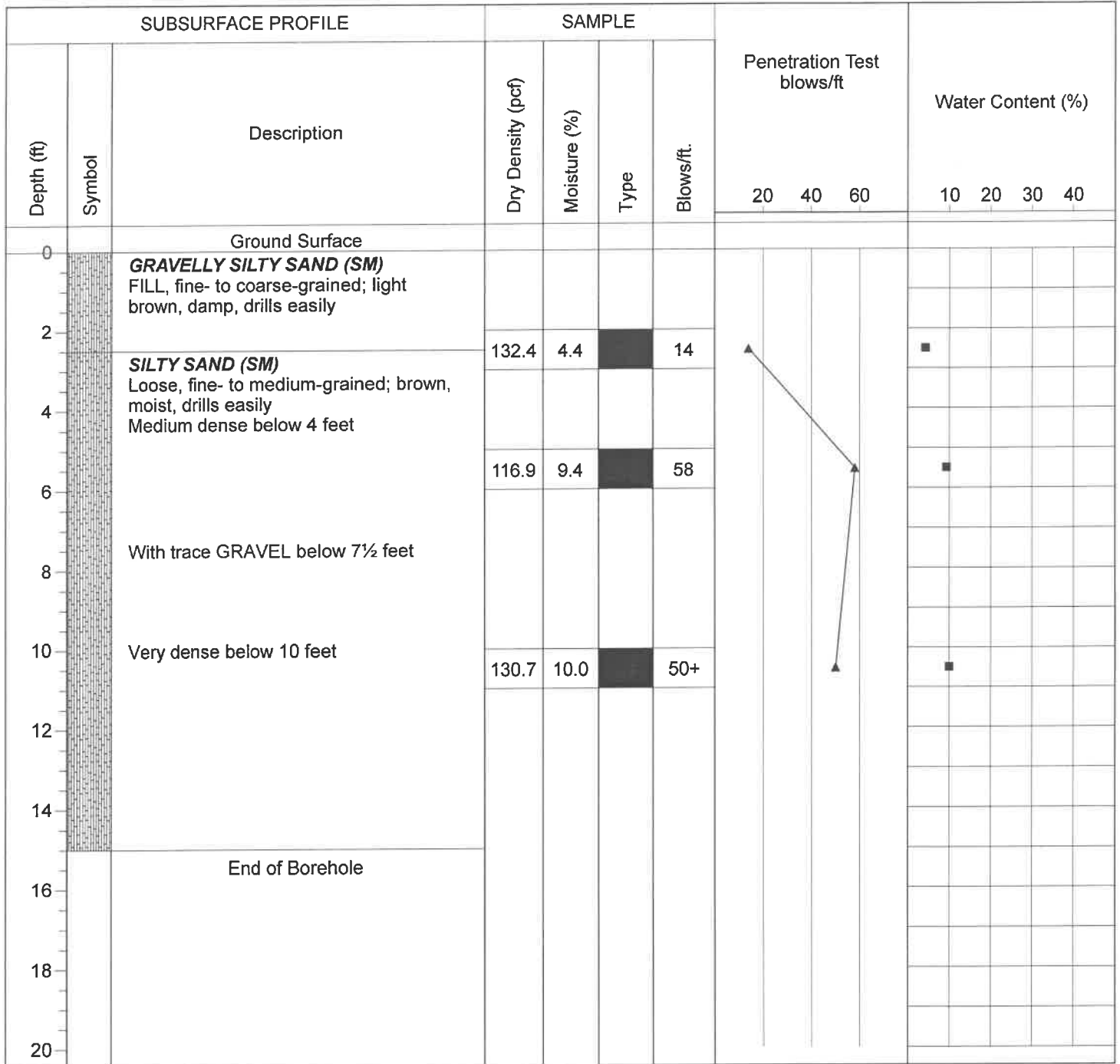
Initial: None

Project No: 012-15087

Figure No.: A-7

Logged By: R. Alexander

At Completion: None



Drill Method: Solid Flight

Drill Rig: CME 45B

Driller: Brent Snyder

Krazan and Associates

Drill Date: 9-18-15

Hole Size: 4½ Inches

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B8

Project: Civic Center

Project No: 012-15087

Client: City of Clovis

Figure No.: A-8

Location: 3rd Street & Hughes Avenue, Clovis, CA

Logged By: R. Alexander

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
2		SILTY SAND (SM) FILL, fine- to coarse-grained; light brown, damp, drills firmly											
4		SILTY SAND (SM) Dense, fine- to medium-grained; brown, moist, drills firmly Very dense below 4½ feet	128.8	5.6		50							
6				7.3		50+							
10		End of Borehole											
12													
14													
16													
18													
20													

Drill Method: Solid Flight

Drill Date: 9-18-15

Drill Rig: CME 45B

Krazan and Associates

Hole Size: 4½ Inches

Driller: Brent Snyder

Elevation: 10 Feet

Sheet: 1 of 1

Log of Boring B9

Project: Civic Center

Client: City of Clovis

Location: 3rd Street & Hughes Avenue, Clovis, CA

Depth to Water>

Initial: None

Project No: 012-15087

Figure No.: A-9

Logged By: R. Alexander

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
2		SILTY SAND (SM) FILL, fine- to medium-grained; light brown, damp, drills firmly											
4		SILTY SAND (SM) Dense, fine- to medium-grained; reddish-brown, damp, drills easily	135.8	3.4		49							
6		Medium dense below 5 feet	133.7	4.1		17							
10		Very dense below 10 feet	134.6	9.1		50+							
16		End of Borehole											
18													
20													

Drill Method: Solid Flight

Drill Rig: CME 45B

Driller: Brent Snyder

Krazan and Associates

Drill Date: 9-18-15

Hole Size: 4½ Inches

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B10

Project: Civic Center

Project No: 012-15087

Client: City of Clovis

Figure No.: A-10

Location: 3rd Street & Hughes Avenue, Clovis, CA

Logged By: R. Alexander

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
0		SILTY SAND (SM) Very loose, fine- to coarse-grained; light brown, damp											
2		Loose below 1 foot Medium dense below 2 feet	132.6	2.7		44							
4		SILTY SAND (SM) Dense, fine- to medium-grained; brown, damp, drills firmly Very dense and drills hard below 4½ feet											
6				5.5		50+							
8													
10			126.6	5.7		50+							
12													
14													
16		SILTY SAND/SANDY SILT (SM) Very dense, medium-grained; light brown, damp, drills hard	117.1	10.4		50+							
18													
20		SILTY SAND (SM) Very dense, fine- to medium-grained; light brown, damp, drills firmly											

Drill Method: Solid Flight

Drill Date: 9-18-15

Drill Rig: CME 45B

Krazan and Associates

Hole Size: 4½ Inches

Driller: Brent Snyder

Elevation: 25 Feet

Sheet: 1 of 2

Log of Boring B10

Project: Civic Center

Project No: 012-15087

Client: City of Clovis

Figure No.: A-10

Location: 3rd Street & Hughes Avenue, Clovis, CA

Logged By: R. Alexander

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
22			124.1	4.5		50+							
24													
26		End of Borehole											
28													
30													
32													
34													
36													
38													
40													

Drill Method: Solid Flight

Drill Date: 9-18-15

Drill Rig: CME 45B

Krazan and Associates

Hole Size: 4½ Inches

Driller: Brent Snyder

Elevation: 25 Feet

Sheet: 2 of 2

Log of Boring B11

Project: Civic Center

Client: City of Clovis

Location: 3rd Street & Hughes Avenue, Clovis, CA

Depth to Water>

Initial: None

Project No: 012-15087

Figure No.: A-11

Logged By: R. Alexander

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
2		SILTY SAND (SM) FILL, fine- to coarse-grained; light brown, damp, drills firmly	120.9	2.9		65							
4		SILTY SAND (SM) Very dense, fine- to medium-grained; brown, damp, drills firmly											
6			118.2	3.9		50+							
8													
10			101.6	7.9		50+							
12													
14													
16		End of Borehole											
18													
20													

Drill Method: Solid Flight

Drill Rig: CME 45B

Driller: Brent Snyder

Krazan and Associates

Drill Date: 9-18-15

Hole Size: 4½ Inches

Elevation: 15 Feet

Sheet: 1 of 1

Log of Boring B12

Project: Civic Center

Project No: 012-15087

Client: City of Clovis

Figure No.: A-12

Location: 3rd Street & Hughes Avenue, Clovis, CA

Logged By: R. Alexander

Depth to Water>

Initial: None

At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft			Water Content (%)			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20	40	60	10	20	30	40
0		Ground Surface											
0		SILTY SAND (SM) FILL, fine- to coarse-grained; light brown, damp, drills easily											
2		SILTY SAND (SM) Medium dense, fine- to medium-grained; brown, damp, drills easily	124.2	3.8		23							
4													
4		Dense below 5 feet											
6			128.8	8.0		50							
8													
10		End of Borehole											
12													
14													
16													
18													
20													

Drill Method: Solid Flight

Drill Date: 9-18-15

Drill Rig: CME 45B

Krazan and Associates

Hole Size: 4½ Inches

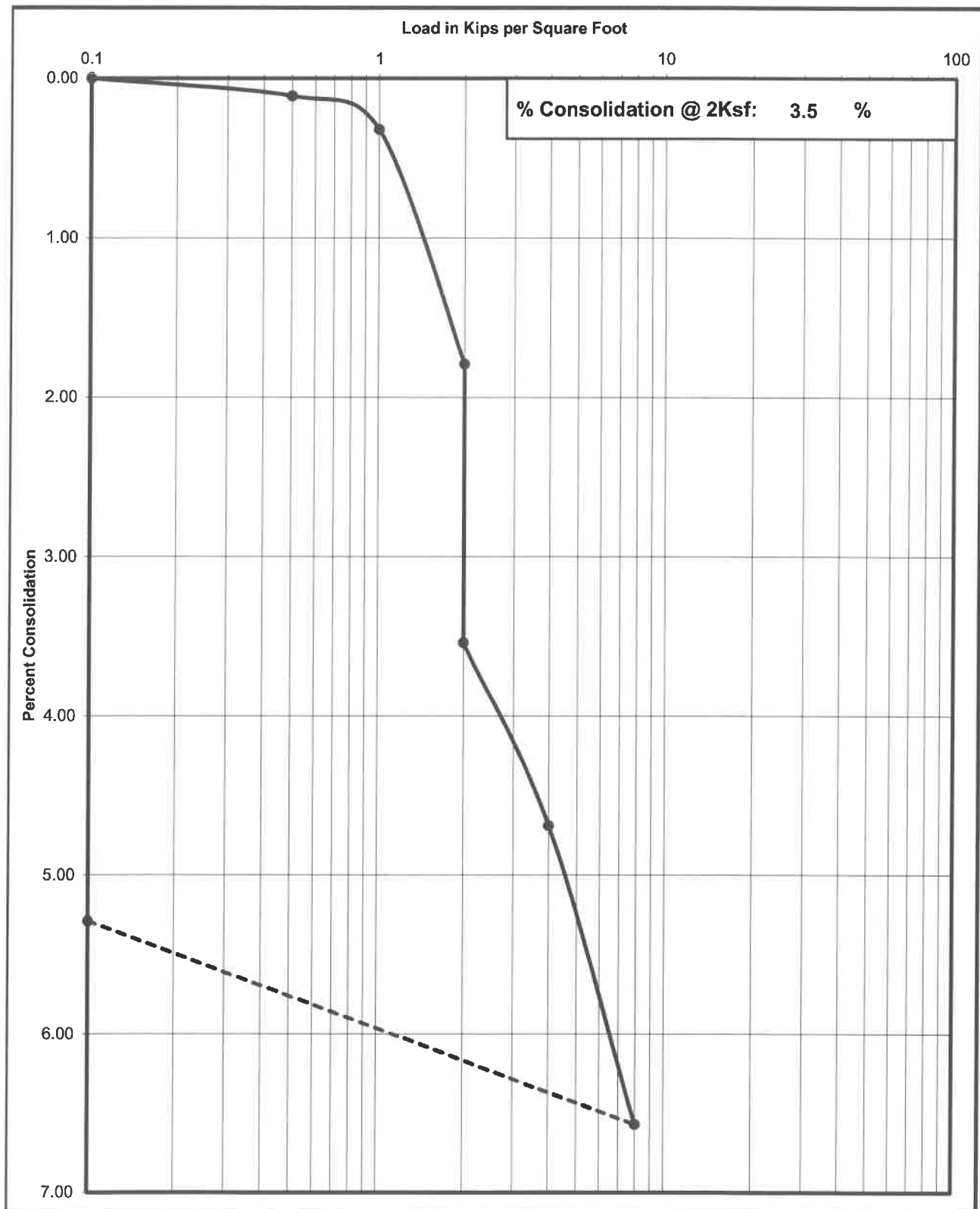
Driller: Brent Snyder

Elevation: 10 Feet

Sheet: 1 of 1

Consolidation Test

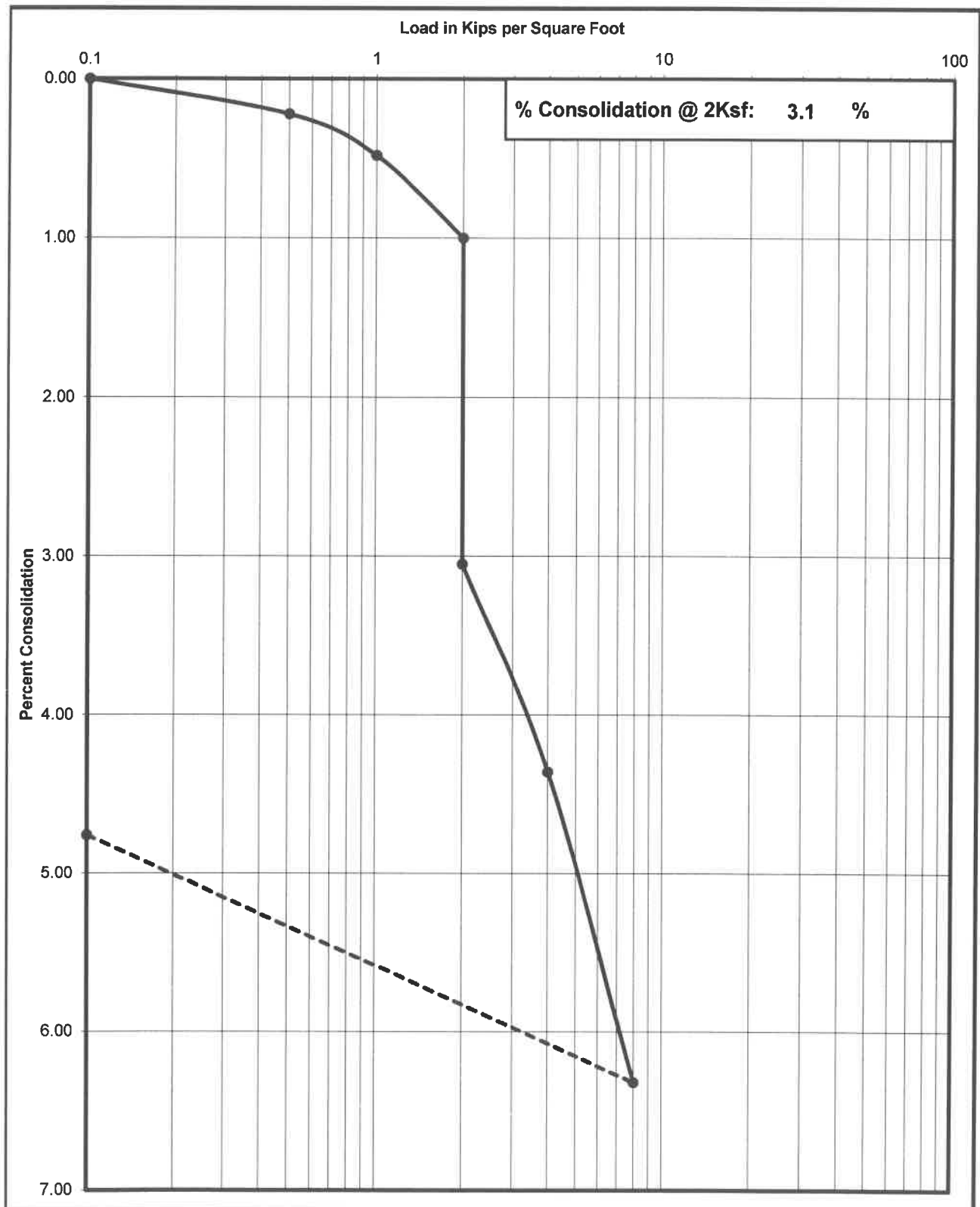
Project No	Boring No. & Depth	Date	Soil Classification
012-15087	B1 @ 2-3'	8/12/2015	SM



Krazan Testing Laboratory

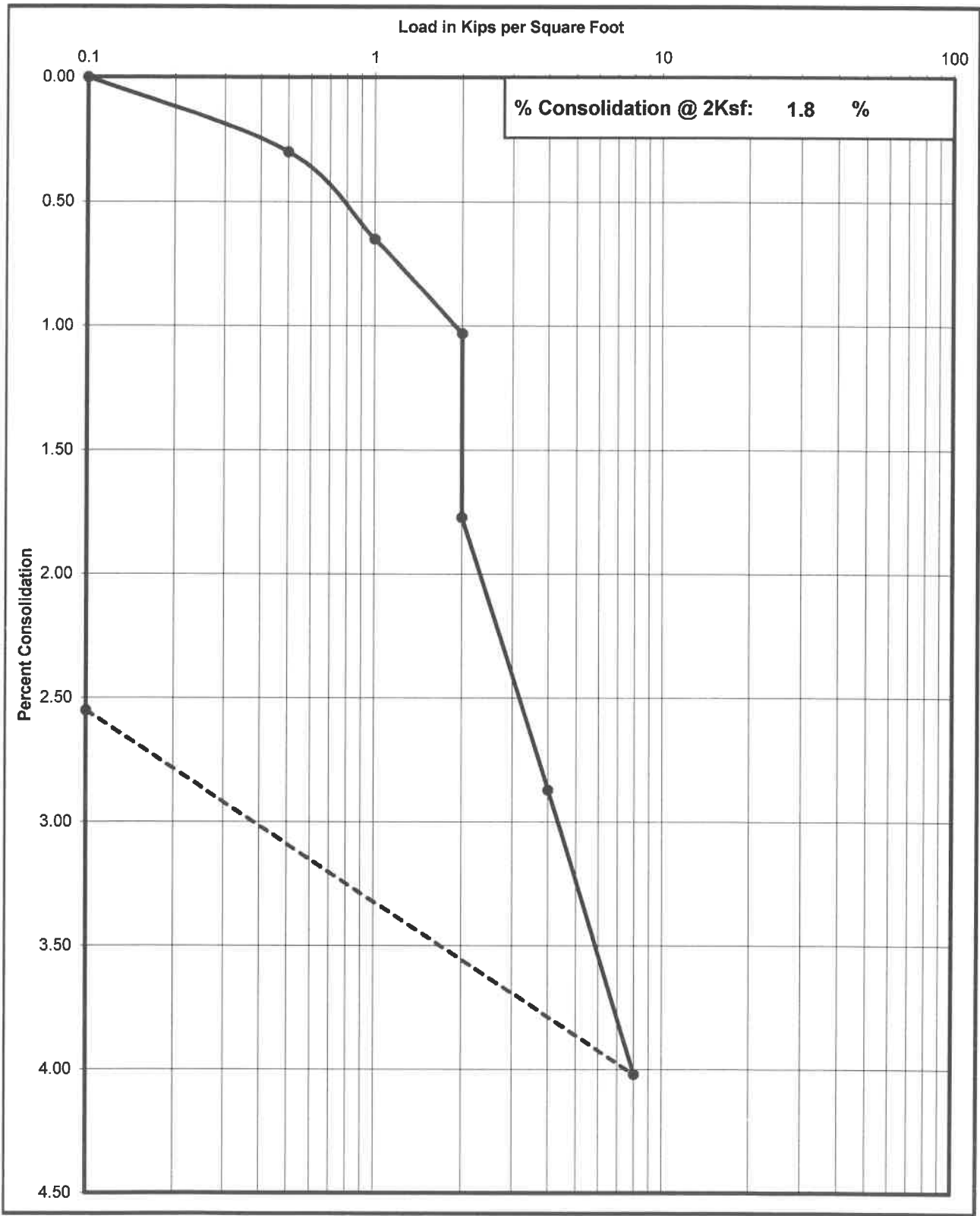
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
012-15087	B4 @ 5-6'	8/12/2015	SM



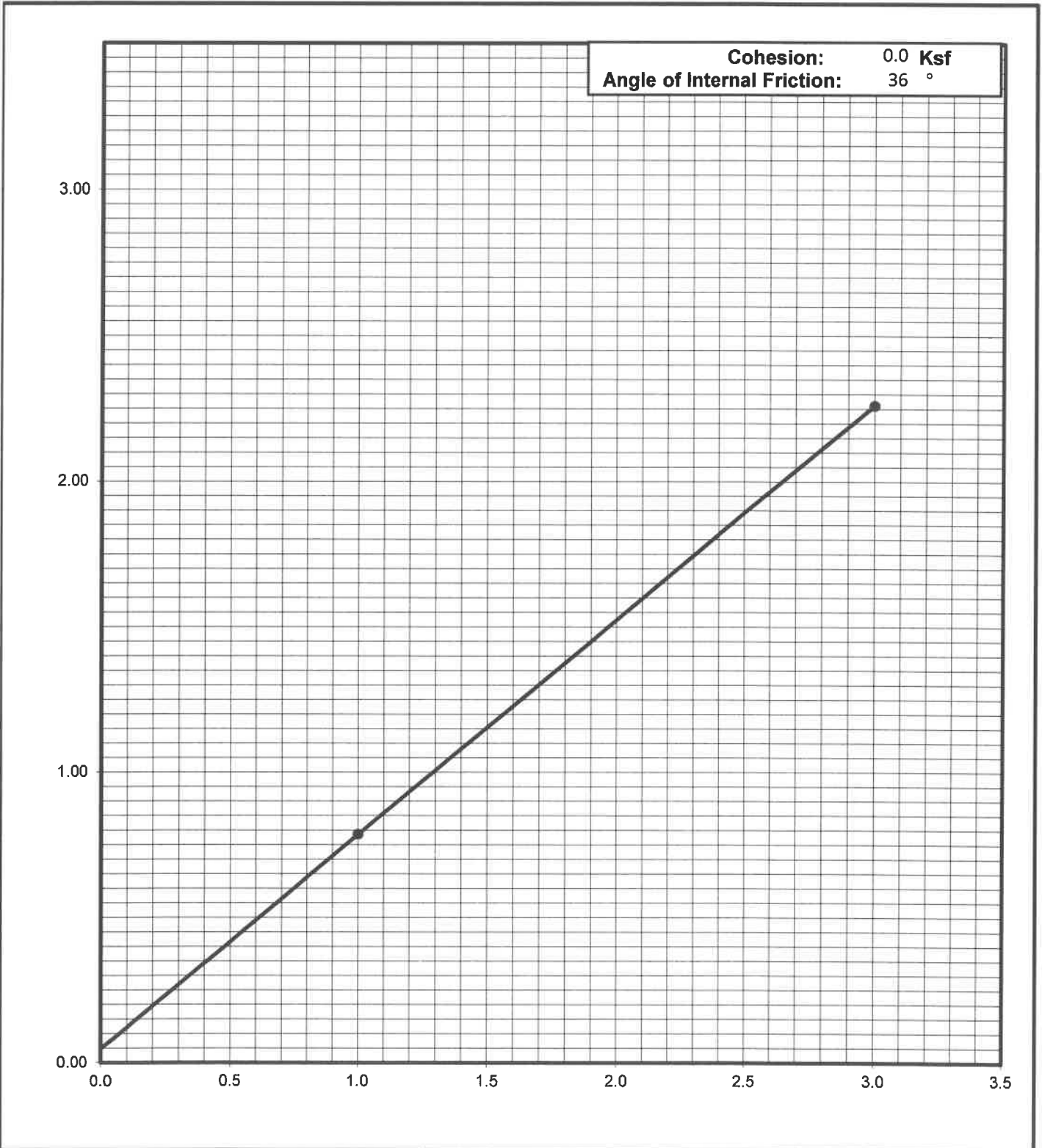
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
012-15087	B7 @ 2-3'	10/14/2015	SM



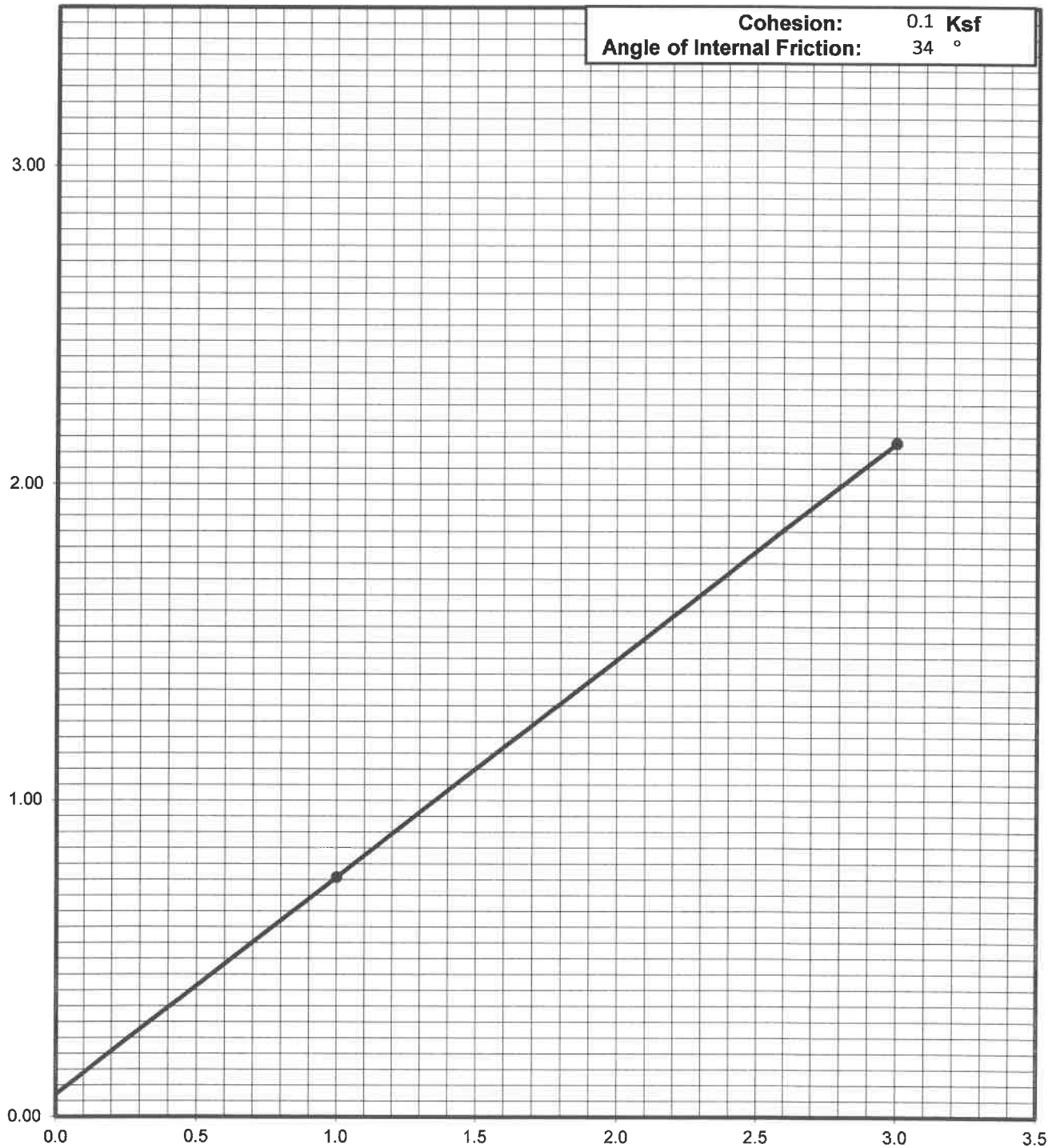
Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
012-15087	B2 @ 2-3'	SM	8/12/2015

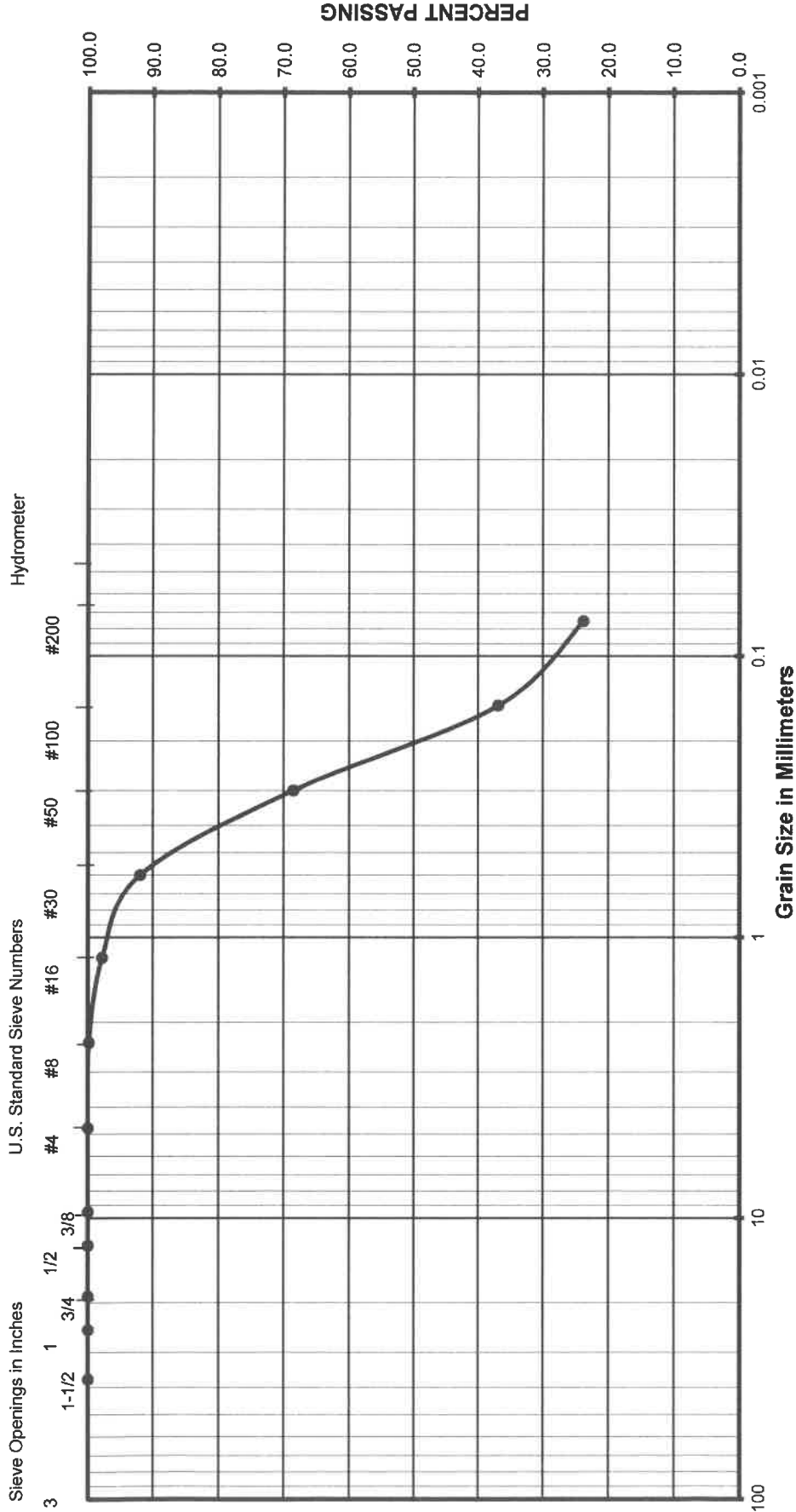


Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
012-15087	B12 @ 2-3'	SM	10/14/2015



Grain Size Analysis

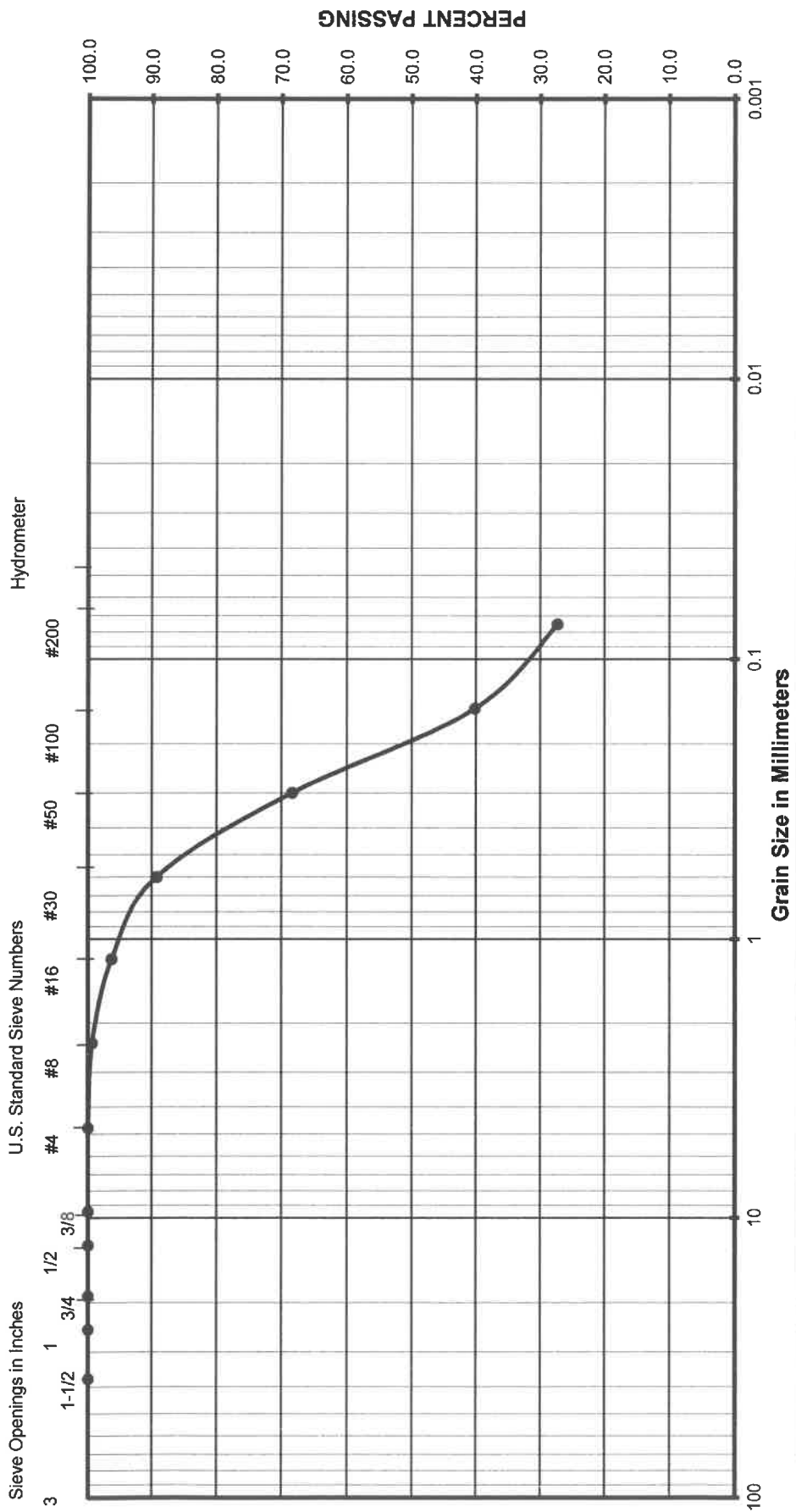


Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

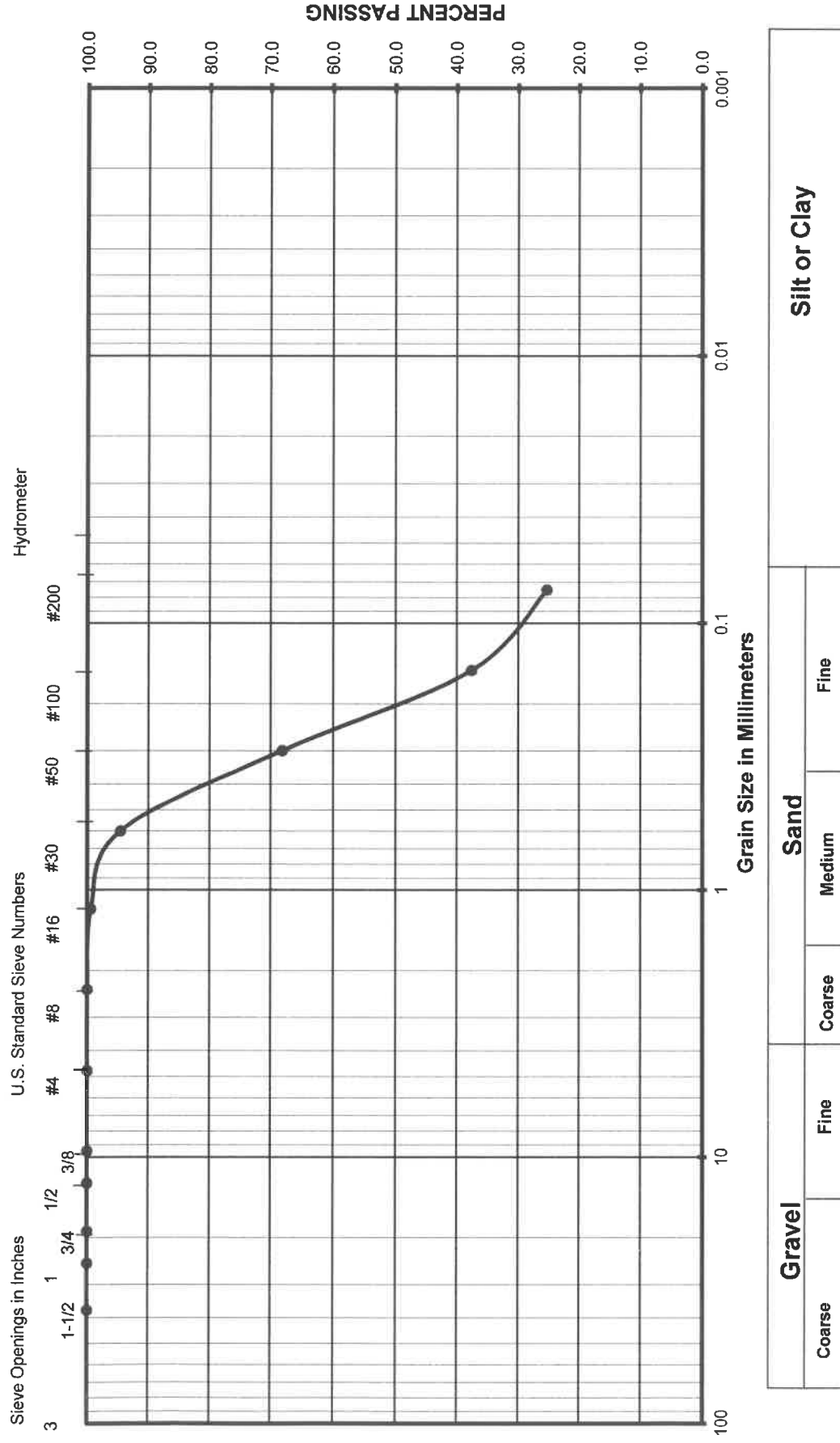
(Unified Soils Classification)

Project Name: Civic Center
 Project Number: 012-15087
 Soil Classification: SM
 Sample Number: B1 @ 2-3'

Grain Size Analysis



Grain Size Analysis



(Unified Soils Classification)

Project Name	Civic Center
Project Number	012-15087
Soil Classification	SM
Sample Number	B7 @ 2-3'

Krazan Testing Laboratory

R - VALUE TEST

ASTM D - 2844 / CAL 301

Project Number : 012-15087
 Project Name : Civic Center
 Date : 8/4/2015
 Sample Location/Curve Number : RV#1
 Soil Classification : SM

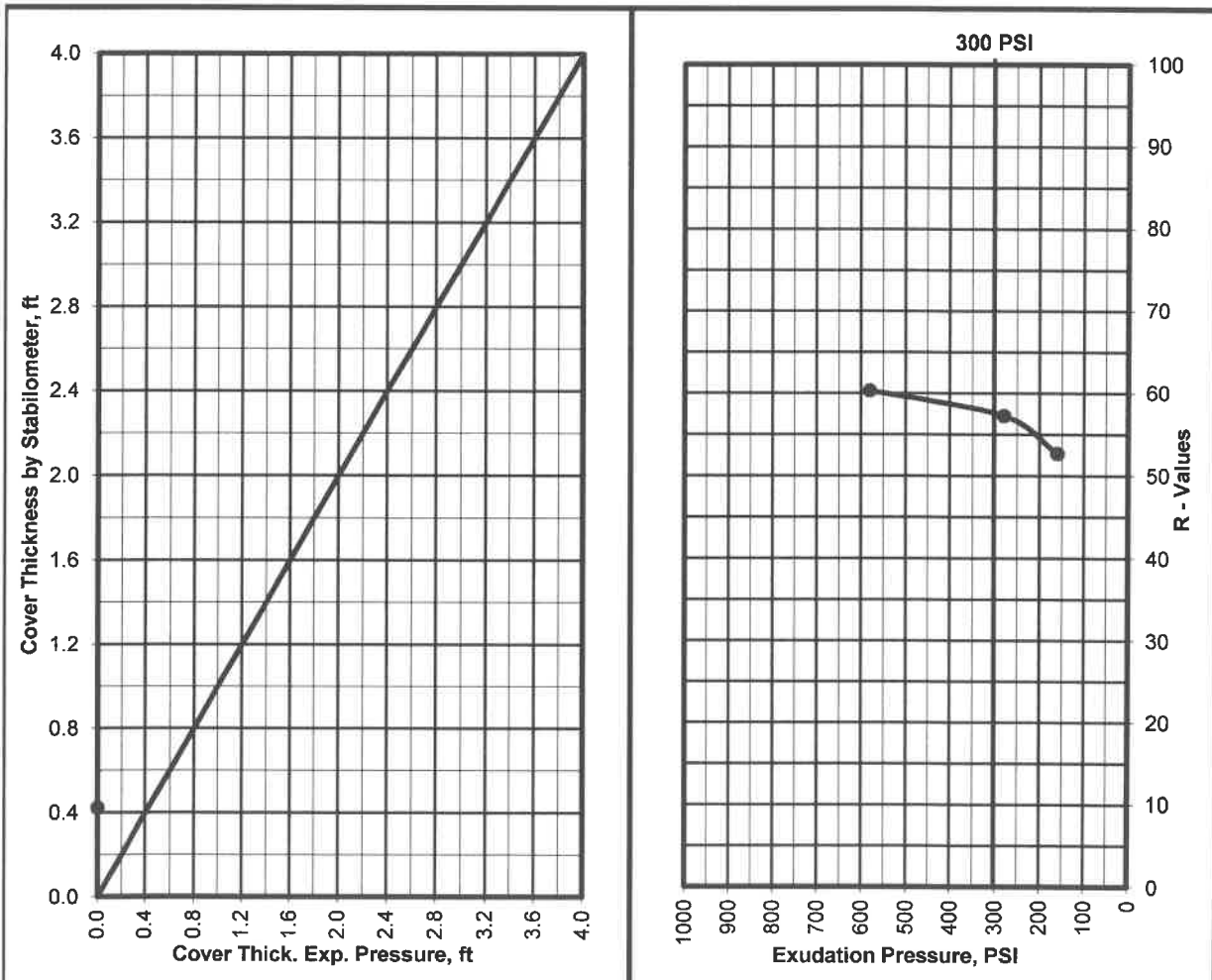
TEST	A	B	C
Percent Moisture @ Compaction, %	10.8	11.3	11.7
Dry Density, lbm/cu.ft.	122.7	124.1	124.0
Exudation Pressure, psi	580	280	160
Expansion Pressure, (Dial Reading)	0	0	0
Expansion Pressure, psf	0	0	0
Resistance Value R	60	57	53

R Value at 300 PSI Exudation Pressure

57

R Value by Expansion Pressure (TI =): 5

Expansion Pressure nil

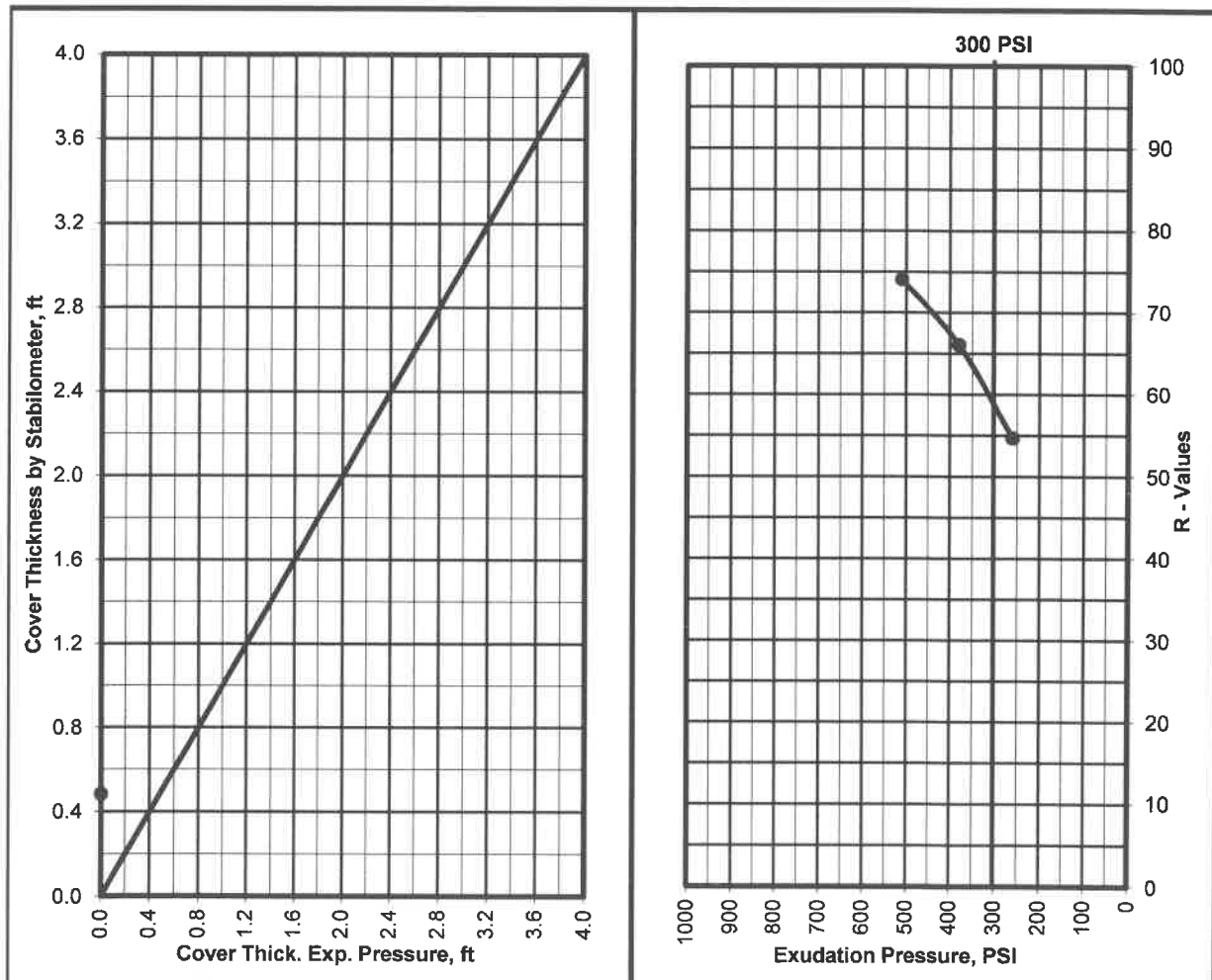


R - VALUE TEST ASTM D - 2844 / CAL 301

Project Number : 012-15087
 Project Name : Civic Center
 Date : 8/23/2015
 Sample Location/Curve Number : RV#2
 Soil Classification : SM

TEST	A	B	C
Percent Moisture @ Compaction, %	9.2	8.7	8.2
Dry Density, lbm/cu.ft.	127.8	128.5	128.7
Exudation Pressure, psi	260	380	510
Expansion Pressure, (Dial Reading)	0	0	0
Expansion Pressure, psf	0	0	0
Resistance Value R	55	66	74

R Value at 300 PSI Exudation Pressure	59
R Value by Expansion Pressure (TI =): 5	Expansion Pressure nil



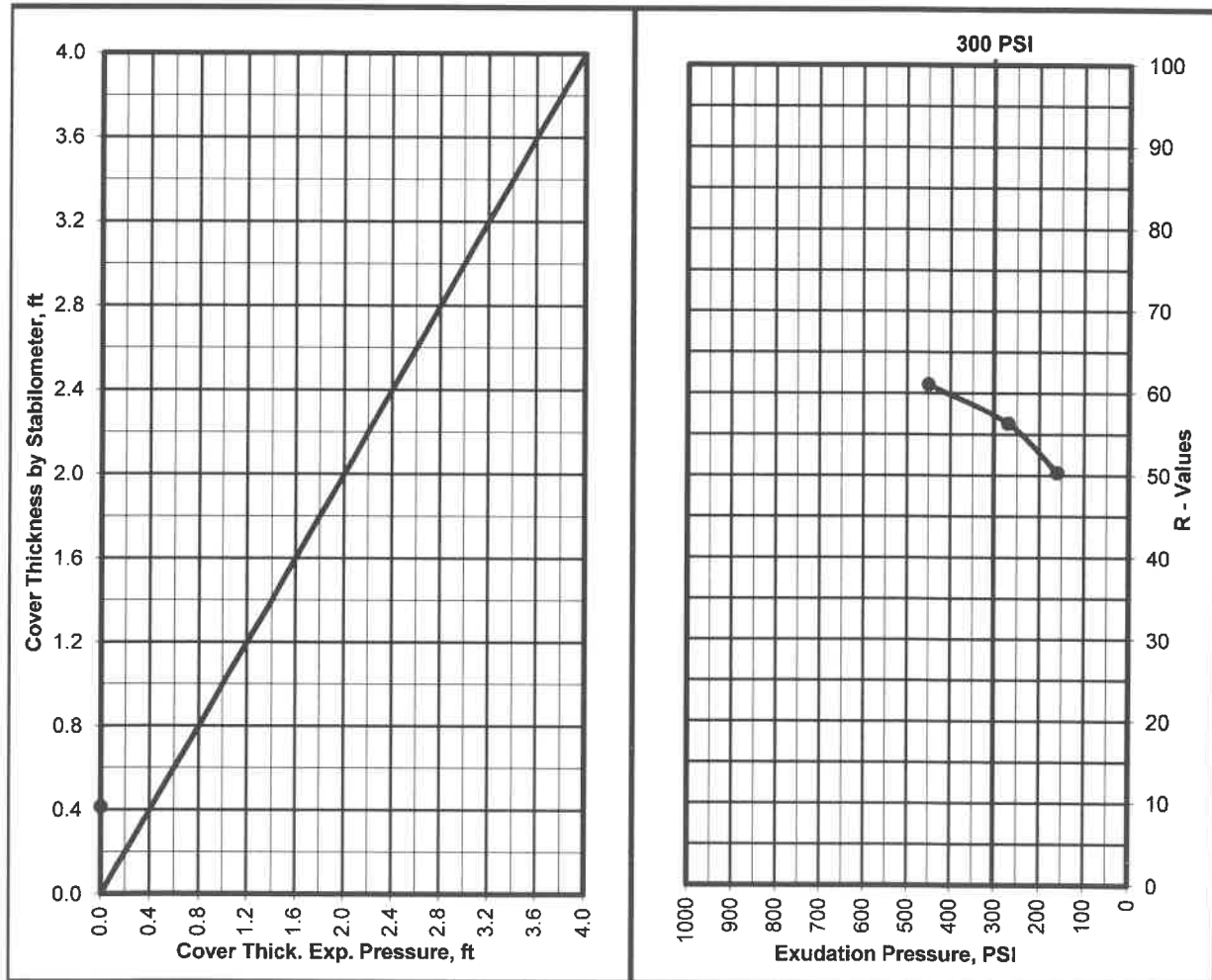
R - VALUE TEST

ASTM D - 2844 / CAL 301

Project Number : 012-15087
 Project Name : Civic Center
 Date : 8/23/2015
 Sample Location/Curve Number : RV#3
 Soil Classification : SM

TEST	A	B	C
Percent Moisture @ Compaction, %	8.8	9.3	9.8
Dry Density, lbm/cu.ft.	127.8	127.6	126.5
Exudation Pressure, psi	450	270	160
Expansion Pressure, (Dial Reading)	0	0	0
Expansion Pressure, psf	0	0	0
Resistance Value R	61	56	50

R Value at 300 PSI Exudation Pressure	57
R Value by Expansion Pressure (TI =): 5	Expansion Pressure nil



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 recompact 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.

APPENDIX C

PAVEMENT SPECIFICATIONS

1. DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term "Standard Specifications": hereinafter referred to is the 2010 Standard Specifications of the State of California, Department of Transportation, and the "Materials Manual" is the Materials Manual of Testing and Control Procedures, State of California, Department of Public Works, Division of Highways. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as defined in the applicable tests outlined in the Materials Manual.

2. SCOPE OF WORK - This portion of the work shall include all labor, materials, tools, and equipment necessary for, and reasonably incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically noted as "Work Not Included."

3. PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 90 percent. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

4. UNTREATED AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class 2 material, 1½ inches maximum size. The aggregate base material shall be spread and compacted in accordance with Section 26 of the Standard Specifications. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent.

5. AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class 2 material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent, and it shall be spread and compacted in accordance with Section 25 of the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

6. ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10. The mineral aggregate shall be Type B, ½ inch maximum size, medium grading and shall conform to the requirements set forth in Section 39 of the 2010 Standard Specifications. The drying, proportioning and mixing of the materials shall conform to Section 39 of the 2010 Standard Specifications, as well.

The prime coat, spreading and compacting equipment and spreading and compacting mixture shall conform to the applicable chapters of Section 39 of the 2010 Standard Specifications, with the exception that no surface course shall be placed when the atmospheric temperature is below 50° F. The surfacing shall be rolled with a combination of steel wheel and pneumatic rollers, as described in Section 39-6 of the 2010 Standard Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

7. FOG SEAL COAT - The fog seal (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of Section 37.

APPENDIX No. 2

**FRESNO METROPOLITAN FLOOD CONTROL
DISTRICT REQUIREMENTS**

96-01 FMFCD REQUIREMENTS FOR STORM DRAIN FACILITIES

96-01.1 Description of Work

The work to be done under this contract shall consist of construction of storm drainage facilities and appurtenances in accordance with the appropriate provisions of the Fresno Metropolitan Flood Control District (FMFCD) Standard Plans and Standard Specifications, dated April 1, 2011, all released addenda, the Construction Plans entitled "*Contract No. 4D-B*", and these Special Provisions thereto. All operations required to complete the project as shown and specified shall be included in the work under this contract.

96-01.2 Order of Work

As the first order of work the Contractor shall be responsible to verify existing flow line elevations and notify the Engineer of any discrepancies and/or specify items of work that must be done in a certain order. In addition, the contractor shall verify the locations of existing underground utilities and notify the Engineer of any conflicts against the proposed storm drain structures.

96-01.3 Permits

Reference is made to Subsection 7-10, 7-34 and 14-2 of the FMFCD Standard Specifications.

The Contractor shall obtain all necessary permits and pay all fees associated therewith, if any. The Contractor shall satisfy himself as to the requirements of the various permits and submission of a bid on this project will be deemed conclusive evidence that the Contractor has done so. The Contractor shall execute an encroachment permit issued by the City of Clovis Planning and Development Services Department, Construction Management Division, (559) 324-2394.

Full compensation for all costs involving permits, including obtaining the permits and paying all fees and charges associated therewith, shall be included in the amount paid for the various bid items, and no additional payment will be made therefor.

96-01.4 Inspection

The City of Clovis inspector will conduct the day-to-day inspection. The District will also make inspections from time to time on an irregular basis. The contractor shall notify the City of Clovis Construction Management Division at (559) 324-2370 and the District's Construction Manager, at (559) 456-3292, two working days prior to beginning construction.

The Contractor shall pay all inspection fees. The final inspection by both the City and the District Inspector will be as specified in Subsection 5-16 of the FMFCD Standard Specifications.

All costs necessary to comply with the conditions of the final inspection shall be borne by the Contractor, including but not limited to any costs incurred moving labor, equipment, and material to the site to complete the work, as required by such final inspection. After final acceptance, the Contractor shall guarantee the work in accordance with the provisions of Subsection 6-9 of the FMFCD Standard Specifications.

96-01.5 Compaction & Compaction Tests

Reference is made to Section 15 of the FMFCD Standard Specifications.

The City shall provide initial compaction tests for all work at locations designated by the engineer. Any required retesting because of failure to pass original tests shall be at the expense of the Contractor, and shall be done by a reputable soils laboratory certified to make compaction tests. Retesting expense shall be billed directly to the Contractor.

Full compensation for providing the required compaction and compaction tests shall be included in the amount bid for the various items of work and no additional payment will be made therefor.

96-01.6 Collateral Work, Cooperation

Reference is made to Section 8-13 of the FMFCD Standard Specifications.

The Contractor shall be aware that other improvements are being installed within the area of construction. The Contractor shall cooperate and coordinate his work with the work of other Contractors working in the area in order to prevent any delay, hindrance, or conflict of respective work schedules.

96-01.7 Notification

Reference is made to Section 8 of the FMFCD Standard Specifications.

The Contractor shall be required to notify all agencies and property owners that will be directly affected by the construction work a minimum of five (5) days prior to start of construction.

96-01.8 Brick and Mortar Plugs

Brick and mortar plugs shall be placed and or removed at the locations shown on the plans. The cost of placing and or removal of all plugs shall be included in the amount bid for the various items of work and no additional compensation will be made therefor.