



South San Francisco Unified School District

400 B Street,
South San Francisco,
Ca 94080

South San Francisco HS -Alterations To Rooms B-12 & B-13 and C-3 & C-4

Project Specifications

19six Project No. 024411.01
DSA A#01-122274

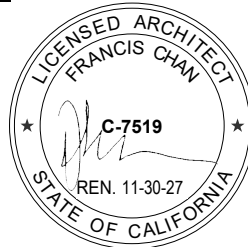
December 4th, 2025

Project Specifications

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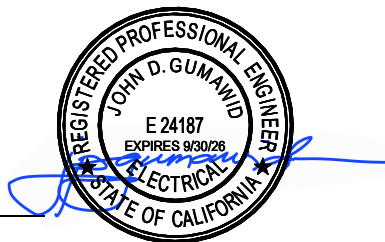
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IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT

APP: 01-122274 INC:

REVIEWED FOR

SS ☒ FLS ☒ ACS ☒

DATE: 01/26/2026

Project Specifications

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PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION 00 01 10

SECTION 00 01 25 – USER GUIDE FOR THE PROJECT MANUAL

PART 1 – GENERAL

1.1 SUMMARY

A. GENERAL:

1. This Guide is provided as a basis for understanding the organization, use and implementation of this Project Manual.

B. DESCRIPTION:

1. Construction Documents:

- a. Defined as the graphic/drawings - graphic representations of the Work which illustrates/indicates the materials, components, systems, etc. and their relationships to one another, including sizes, shapes, fit, location, and connections and at specific locations the product & manufacturer, etc., is noted in the drawing documents as specific and/or general notes and written documents prepared and/or assembled by the Architect, his or her consultant engineers for communicating the design intent of the project and administering the contract for its construction.

1. These include Bidding Requirements (Invitation to Bid, Instructions to Bidders, and Bid Forms) and the Contract Documents.
2. Refer to all Division one documents.

2. Demolition and Protection Documents:

- a. Defined as the graphic/drawings - graphic representations of the Demolition and Protection Work, which illustrates/indicates the materials, components, finishes, fixtures, etc., is noted in the drawing documents as specific and/or general notes and written documents prepared and/or assembled by the Architect, his or her consultant engineers for communicating the Demolition and Protection intent of the project and administering the contract for the work.

1. These include Bidding Requirements (Invitation to Bid, Instructions to Bidders, and Bid Forms) and the Contract Documents.
2. Refer to all Division one documents.

3. Contract Documents:

- a. Defined as the legally enforceable requirements that become part of the contract when the agreement is signed, these include;
 1. Contract Forms: agreement, bonds and certificates
 2. Conditions of the Contract: define the basic rights, responsibilities, and relationships of the parties involved in the construction process
 3. Project Manual – Documents, Bidding and Contract Requirement Documents and Specifications, Drawings, Addenda, and Contract Modifications
 - a. Written instruments used to add to, delete from or otherwise modify the Work after the construction agreement has been signed).

- b. They describe the proposed construction (referred to as the "Work") that results from performing services, furnishing labor, and supplying and incorporating materials and equipment into the construction.

4. Drawings.

4. Specifications:

- a. Divided into multiple sections as included herein.
- b. The Specifications define the qualitative requirements (at specific locations the quantity) for manufactures products, materials, and systems and the standards of workmanship required for installation.
- c. The specifications provide information regarding Demolition and Protection.
- d. They also at times include schedules which may define quantities and/or locations for installation.
- e. Division 1 documents and sections constitute the GENERAL REQUIREMENTS necessary for the Project; the specification sections comprise the Technical Specifications portion of the Project Manual.

5. Bidding and Contract Requirements:

- a. These Documents are included to clarify specific criteria related to general requirements and include all Division 1 and including the General Conditions and Supplemental Conditions when included.

6. Addenda:

- a. Written and/or graphic documents issued to clarify, revise, add to, or delete information in the original bidding documents or in previous addenda.

7. Alternates:

- a. Add Alternate: Specific items which are intended to be listed as separate line item in addition to overall bid of project but not included in base bid by General Contractor. Owner and their representative will make decision if item will be incorporated into project and final bid price.
- b. Deductive Alternate: Specific items to be listed as separate deductive line item but not to be included in base bid by General Contractor. Owner and their representative will make decision if item will be deducted from base bid.

- 8. Geotechnical Report: Report referred to in this Project Manual is available upon request from the Owner for reference only.

C. DIVISION 1

- 1. Include 'Documents' as part of Bidding and Contract Requirements which expand on general requirements.
- 2. Division 1 of the Specifications expands on certain broad provisions of the Conditions of the Contract and governs the execution of all Technical Sections of the Specifications.
 - a. Sections included in Division 1 specify the administrative and procedural requirements, as well as temporary facilities, required for the Project.
 - b. These sections shall be used in concert with the General Condition document(s)

- c. All requirements stated in Division 1 apply to and will be in force for all Sections included in the specifications.

D. OWNER

- 1. Galt Joint Union Elementary School District contract documents as furnished by the **Owner** and attached to this Project Manual.
 - a. DIVISION 0 BIDDING AND CONTRACT REQUIREMENTS
- 2. The AIA A201 General Conditions of the Contract for Construction included shall be used in conjunction with General and Supplemental conditions provided by the Owner, if any. The Owner's documents include provisions for the relationship between the Owner and General Contractor, (also listed as Lessor and/or Entity) and may include additional provisions related to the Architect and the Architect's consultants.
 - a. Where AIA A201 and other Division 1 Sections are herein included in addition to the Owner's documents, the most restrictive of the documents shall govern and the Architect and the Architect's Consultants shall not be reduced in their protection related to the Owner, Contractor and or laws as provided for in the AIA A201 and the Architect's Contract with the Owner.

E. PRODUCT REFERENCES:

- 1. The Section titles represent a class of product and may be stated in the singular or plural without regard to the actual quantity used on the project.
- 2. The organization of product specifications by Section is not meant to define subcontracts or other divisions of work by the trades.

F. MANUAL FORMAT:

- 1. General: The top of each page of each Section appears with;
 - a. Project Name
 - b. Project Number
 - c. Document or Specification Section name and number
 - d. Page of document or specification
- 2. Underlined and Boldface Type:
 - a. Underlining and bolding have been used in different combinations throughout the Project Manual to highlight headings and significant text.
 - 1. This device has been used to assist the user in finding items of information or to emphasize the importance of certain information.
 - a. No other meaning is attached to the use of boldface and underlined text which provides and/or implies any more or less importance.
- 3. Dates:
 - a. The official date of issue of the Project Manual appears on the cover sheet of this Project Manual.
 - 1. Dates subsequent to that date on individual Section pages indicate reissue of entire Sections or portions thereof for clarification.

- 4. Deleted scope/text related to revisions:

- a. Items lined out typically represent deleted items and/or text as part of a revision during Bidding as part of Addenda and also during construction as part of written changes and will have a line or multiple lines thru them;

~~1. Deleted Revisions:~~

~~2. Deleted Revisions:~~

5. Added Revisions:

- a. Items in ***bold italics*** typically represent added items and/or text as part of a revision during Bidding as part of Addenda and also during construction as part of written changes.
- b. If multiple revisions have been made in multiple issuances of a document, then the previous revision(s) will stay as *italic* type text, but only the most current revisions shall be ***italics and bold.***

1.2 DEFINITIONS AND INTERPRETATIONS:

A. WORDS AND TERMS:

1. Those which are frequently used with special meanings, within but not limited to this Project Manual and drawings are defined in;
 - a. Sections 01 41 00 – Regulatory Requirements and Sections 01 42 00 – References.

B. GOVERNING DICTIONARY:

1. "The Merriam-Webster Dictionary of the English Language".

C. SPECIFICATION LANGUAGE:

1. These Specifications are typically written in the imperative mood, as defined in the Construction Specifications Institute's Manual of Practice.
 - a. Imperative language is directed to the General Contractor.
 1. The indicative mood is employed on occasion when such sentence structure is necessary to convey the intended meaning in a more accurate or understandable form.
 - a. The text is streamlined, with the colon (:) employed as a symbol for the words "shall be", "shall have", "shall conform with", "shall comply with", or "shall meet the requirements of".
 - b. The colon is also used to separate a paragraph title or heading from the text that follows.

D. GENERAL CONTRACTOR:

1. The General Contractor may also be listed in documents herein included as the Lessor, Entity and/or the Corporation and where listed as such shall be the same as listed other places as General Contractor.

1.3 QUANTITIES AND SCHEDULES

- A. In specific locations the specifications may list quantities, but it is still the responsibility of the General Contractor to confirm & coordinate.

- B. In specific locations the specifications may include schedules for specific items to assist the General Contractor.

- 1. The General Contractor shall still be responsible to confirm all items, coordinate with documents & associated scopes of work, and clarify through the submittal process.

1.4 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Scope as indicated in drawings, documents as part of Project Manual and specifications.
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
- C. Related Documents include, but are not limited to the following:
 - 1. DIVISION 0 as furnished by the Owner.

PART 2 - **PRODUCTS**

Not Used

PART 3 - **EXECUTION**

Not Used

END OF SECTION 00 01 25

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SECTION 01 11 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. The work of this contract includes but is not limited to the following:
 - 1. Provide and furnish all labor, material, equipment, transportation, and any additional Professional Engineering Services necessary for installation, on-site construction along with on-site utilities and improvements for:
 - a. **Site improvements**
 - b. **Alterations to Building C including: accessibility improvements to classroom C3 and alterations to classroom C4**
- C. Construction of On-Site improvements consisting of; but not limited to the following:
 - 1. Minor sidewalk alterations
 - 2. A.C. paving, curbs, gutters, ramps and walks as indicated
 - 3. Striping
- D. Provide and furnish all labor, material and equipment necessary for site improvements, utilities along with all other alternate bid items approved and accepted for construction by the **Owner**.
- E. Refer to these specifications and the Construction Drawings for detailed description of the work required.
 - 1. All directives and/or changes that affect this project shall come from the **Owner** to the **Architect** prior to being included into the project.
 - 2. Should any existing conditions such as deterioration or noncomplying construction be discovered that is not covered by the DSA approved documents wherein the finished work will not comply with Title 24, California Code of Regulations, a construction change document, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work, in compliance with California Administrative Code 4-317(c).
- F. Related work:
 - 1. Documents affecting work of this Section and Divisions 2 through 49 of Specifications also include, but are not necessarily limited to, General Conditions, and Division 1 of these Specifications.
 - 2. Notices, Instructions, Bid Forms, Agreements and other titled documents are listed in Division 0.
- G. Project Contractors:
 - 1. All work shall be performed by California Licensed Contractors.

- a. The **General Contractor** shall coordinate all construction work and control the project and subcontractors, in accordance with Contract Documents.
 2. **General Contractor's** work shall also include but not be limited to the following, except as specifically noted, provide and pay for:
 - a. Water, heat, telephones, and utilities required for construction.
 - b. Other facilities and services necessary for proper execution and completion of the work.
 - c. Secure and pay for, as necessary for the proper execution and completion of work, and as applicable at the time of receipt of bills.
 - d. Give required notices.
 3. Construction shall comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities, which govern the performance of the work. Copies shall be retained at all times at the project site by the Construction Superintendent, refer to Section 01 41 00 – Regulatory Requirements and Section 01 42 00 – References.
 4. Promptly submit written notice of any observed variances of Contract Documents from legal requirements for **Architect's** review and interpretation.
 5. Enforce strict discipline and good order among employees. Do not employ unfit persons or persons not skilled in assigned task on the work.
- H. Sustainability
1. This project is subject to the California Green Building Standards Code
 - a. Refer to Division 1 and project specification sections for related requirements.

1.2 CONTRACT METHOD

- A. Construct Work under a lump sum Contract or as defined in the proposal, addenda, and including alternates accepted by the **Owner**.

1.3 GENERAL CONTRACTOR USE OF PREMISES

- A. Confine Operations at project site to areas permitted by:
 1. Law
 2. Ordinances
 3. Permits
 4. Contract Documents
 5. Agencies having jurisdiction
- B. Do not unreasonably encumber site with materials or equipment.
- C. Do not load structure with weight that will endanger it.
- D. **General Contractor** shall assume full responsibility for protection and safekeeping of products stored on premises.
- E. Obtain and pay for use of any additional storage or work areas needed for operations.

PART 2 - PRODUCTS

Not Used

South San Francisco High School
Alterations to Rooms C-3 & C-4
Project Specifications

19six Architects Project No. 24411.01
DSA A#: 01-122274

PART 3 - **EXECUTION**
Not Used

END OF SECTION 01 11 00

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SECTION 01 21 00 – UNIT PRICES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Unit Prices described herein have been established to allow the **Owner** to determine additional costs associated with this scope of work when required.

1.2 RELATED REQUIREMENTS

- A. Refer to Division 0 – Bidding and Contract Requirements and Division 1 – General Requirements.
- B. Pertinent Specification Sections: As noted in individual Unit Price items below.

1.3 MODIFICATIONS TO WORK AND/OR MATERIALS

- A. If **Owner** elects to proceed with Unit Price items, make all modifications to Work required of selected Unit Price scope of work.
- B. Provide and furnish all labor, material and equipment necessary for services to install and construct Unit Price items approved and accepted for construction by the **Owner**.

PART 2 - PRODUCTS

2.1 DESCRIPTION OF ALLOWANCES

- A. Unit Price

1. Item: Concrete Slab Vapor Emission Control Treatment

- a. Section: 07 28 00
- b. Description: Provide Unit Price per Square Foot of remedial slab treatment as specified in Section 07 28 00 for each of the following potential conditions:
 - 1. Total floor area requiring treatment is less than 900 s.f.

2. Item: Hazardous Materials Abatement

- a. Section: Division 00 and Sections 02 41 13, and 02 41 19
- b. Description: Provide remediation as prescribed in the Hazardous Materials Report furnished by the **Owner**

PART 3 – EXECUTION

- A. All unit prices shall be tracked separately via Change Order by **General Contractor** and included in Payment Requests.

END OF SECTION 01 22 00

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SECTION 01 25 00 SUBSTITUTION & DEVIATION PROCUDRES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 1. Ensure that specified products are furnished and installed in accordance with design intent by following procedures established herein for Substitution and Deviation requests for review by the **Architect** and their Engineers and consultants.
- C. The following forms are included within the scope of this specification section, and shall be used as needed and/or required:
 1. During Bidding Phase:
 - a. Substitution Request Form
 - 1) Electronic File form will be supplied by **Architect**.
 - 2) For all product substitutions, the **General Contractor** shall complete all sections of the form and provide for **Architect's** review within the time frame allowed prior to bid date.
 - 3) All related or supporting work that would be required to change must be identified in the Substitution Request.
 - a) Design and construction work and costs associated with a Substitution Request shall be included in the proposed substitution.
 - b) Design and construction work and costs associated with a proposed Substitution which are not identified at time of **Architect's** acceptance of proposed substitution, but which are subsequently found to be required, shall be provided by the **General Contractor** at no additional cost to the **Owner**.
 2. During Construction Phase:
 - a. Deviation Request Form
 - 1) Electronic File will be supplied by **Architect**.
 - 2) For all proposed deviations, the **General Contractor** shall complete all sections of the form and provide at the time of submittal **Architect's** review and consideration.
 - 3) All related or supporting work that would be required to change must be identified in the Deviation Request.
 - a) Design and construction work and costs associated with a Substitution Request shall be included in the proposed deviation.
 - b) Design and construction work and costs associated with a proposed Deviation which are not identified at time of **Architect's** acceptance of proposed deviation, but which are subsequently found to be required, shall be provided by the **General Contractor** at no additional cost to the **Owner**.

1.2 QUALITY ASSURANCE

A. During Bidding:

1. Coordination of Substitution Requests:

a. General:

- 1) Prior to each Substitution Request, the **General Contractor** shall carefully review and coordinate all aspects of each item being proposed.
- 2) **General Contractor** shall verify that each item of the Substitution Request conform in all respects with the specified requirements.
- 3) **General Contractor's** signature is required on each Substitution Request, which shall certify that required coordination of all items has been performed.
- 4) It shall be the **General Contractor's** responsibility to ensure there is no conflict with other items and to notify the **Architect** in any case where the **General Contractor's** Substitution Request may concern work by another Contractor or the **Architect**. The **General Contractor** is solely responsible for coordination of Substitution Requests among all related crafts performing the Work.
- 5) The review of the **General Contractor's** Substitution Requests shall not relieve the **General Contractor** of responsibility for any error or of any obligation for accuracy of dimensions and details, for agreement with and conformity to the Contract, or responsibility to fulfill the Contract as prescribed. Nor shall such review be considered as approval of any deviation or conflict unless the **Architect** has been expressly advised of the same as set forth immediately above, and the **Architect** has expressly approved such deviation or conflict.
- 6) Proposed Substitutions shall not reduce the Sustainability Criteria requirements for project as identified in Division 1.

B. During Construction:

1. Coordination of Deviations:

- a. **General Contractor** shall submit a request for Deviations when they deem it necessary to provide a complete submittal, and /or when minor changes are felt needed.
 - 1) Deviations shall be minor in scope and shall not change manufacturers or assemblies.
 - 2) Proposed Substitutions shall not reduce the Sustainability Criteria requirements for project as identified in Division 1.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. General:

1. Use during Bidding.
2. Refer to specific Specification Sections for items not allowing a substitution.

B. **Architect's** and **Owner's** review and acceptance required during bidding phase.

1. Contract is based solely on materials, equipment and construction industry standards listed or described in the bid documents (including addenda), and does not contemplate any substitutions.

2. Refer to required Substitution Request Form in this Section.
- C. "Or equal" and/or "Equivalent"
 1. Where this phrase occurs in the Contract Documents, it refers to a PRODUCT which is equivalent to the specified product in terms of chemical composition, color, finish, configuration, and performance standards, etc.; do not assume that the materials, equipment, or methods will be approved as equal/equivalent unless the item has been specifically so reviewed and approved for this Work.
 - a. Any product by a Manufacturer listed as an "Acceptable Manufacturer" is not necessarily considered an "Or Equal" or "Equivalent". All proposed products which are not the specified product are subject to the equivalency criteria as noted above.
 2. The decision of the **Architect** and **Owner** shall be final.
- D. In making a request for substitution, the **General Contractor** shall provide the following in accordance with the Substitution Request Form and Bidding requirements set forth in this Section.
 1. They have personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified, including size, chemical composition, color, finish, configuration, performance standards, functionality, compatibility with other assemblies and systems, etc.
 2. They will provide the same warranty for the proposed substitution as for product or method specified.
 3. They will coordinate installation of accepted substitution into work, making such changes as may be required for the work and all associated/supporting trades' work to be complete in all respects at no additional cost to the **Owner**.
 - a. They shall waive all claims for additional costs related to the substitution which consequently or subsequently become apparent.
 4. Cost data is complete and includes all related costs under their Contract.
 5. Shall submit detail itemized cost statement showing labor, material installation, overhead and profit for each substitution being requested.
- E. Substitutions will not be considered if:
 1. Acceptance of substitution shall require substantial revision of Contract Documents by the **Architect, Owner** and/or their Consultants.

2.2 DEVIATIONS

- A. General:
 1. Use during Construction.
 2. Refer to Specific Specification Sections for items not allowing a deviation.
- B. **Architect's** and **Owner's** review and acceptance required during construction phase.
 1. Contract is based solely on materials, equipment and construction industry standards listed or described in the bid documents (including addenda), and review of proposed deviations shall be done with understanding that this is done to accommodate unforeseen conditions.
 2. Refer to required Deviation Request Form included herein.

C. "Or equal" and/or "Equivalent"

1. Where this phrase occurs in the Contract Documents, it refers to a PRODUCT which is equivalent to the specified product in terms of chemical composition, color, finish, configuration, and performance standards, etc.; do not assume that the materials, equipment, or methods will be approved as equal/equivalent unless the item has been specifically so reviewed and approved for this Work.
 - a. Any product by a Manufacturer listed as an "Acceptable Manufacturer" is not necessarily considered an "Or Equal" or "Equivalent"; all proposed products which are not the specified product are subject to the equivalency criteria as noted above.
2. The decision of the **Architect** and **Owner** shall be final.

D. In making a request for deviation, the **General Contractor** shall provide the following in accordance with the Deviation Request Form.

1. They have personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified, including size, chemical composition, color, finish, configuration, performance standards, functionality, compatibility with other assemblies and systems, etc.
2. They will provide the same warranty for the proposed deviation as for product or method specified.
3. They will coordinate installation of accepted deviation into work, making such changes as may be required for work and all associated/supporting trades' work to be complete in all respects at no additional cost to the **Owner**.
4. They shall waive all claims for additional costs related to the deviation, which consequently or subsequently become apparent.
5. Cost data is complete and includes all related costs under their Contract.
6. Shall submit detail itemized cost statement showing labor, material installation, overhead and profit for each substitution.

E. Deviations will not be considered if:

1. They are indicated or implied on Shop Drawings or Project Data submittals without formal request submitted in accordance with this Section.
2. Acceptance of deviation shall require substantial revision of Contract Documents by the **Architect, Owner** and/or their Consultants.
3. The cost of additional submittal services for Architectural review or redesign is not compensated for by the **Owner**.

PART 3 - **EXECUTION**

Not Used

END OF SECTION 01 25 00

SUBSTITUTION REQUEST FORM

TO: **19six Architects**

PROJECT:

SPECIFIED ITEM: _____

Section No.: _____

Paragraph No.: _____

Description: _____

Proposed Substitution: _____

Reason for Substitution:

I. Information on changes to Drawings and/or Specifications which proposed Substitution will require: provide written response below or attach responses if additional space is required.

1. Will changes to the building design, including engineering & detailing be caused by this Substitution?

2. What effect does Substitution have on other trades?

3. What are the differences between proposed Substitution & specified item?

4. What are differences in product cost and delivery time?

5. What is manufacturers written warranties / guarantees of proposed Substitution?

II. Attach data which includes: product description, specifications, drawings, photographs, performance and test data required for evaluation of request; with applicable portions of data clearly identified.

III. Attach data which includes a description of changes to Contract Documents that proposed Substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed Substitution does not affect dimensions shown on drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested Substitution.
3. The proposed Substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be readily available for the proposed Substitution.
5. Finishes will not be altered

The undersigned further states that the function, appearance, and quality of the proposed Substitution are equivalent or superior to the specified item.

Submitted by:

Subcontractor Signature: _____

Subcontractor Name & Company (print): _____

Address: _____

Date: _____ Telephone: _____

General Contractor Signature: _____

General Contractor Name & Company (print): _____

Address: _____

Date: _____ Telephone: _____

Attachments: _____

For use by Architect:

☐ Accepted.

☐ Not Accepted.

☐ Accepted as noted.

☐ Received too late.

By: _____

Date: _____

Remarks: _____

END OF DOCUMENT

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DEVIATION REQUEST FORM

Note: This form used during Construction phase only

TO: **19six Architects**

PROJECT:

SPECIFIED ITEM: _____

Section No.: _____

Paragraph No.: _____

Description: _____

Proposed Deviation: _____

Reason for Deviation:

I. Information on changes to Drawings and/or Specifications which proposed Deviation will require: provide written response below or attach responses if additional space is required.

1. Will changes to the building design, including engineering & detailing be caused by this Deviation?

2. What effect does Deviation have on other trades?

3. What are the differences between proposed Deviation & specified item?

4. What are differences in product cost and delivery time?

5. What is the manufacturer's written warranty and/or guaranty of proposed Deviation?

II. Attach data which includes: product description, specifications, drawings, photographs, performance and test data required for evaluation of request; with applicable portions of data clearly identified.

III. Attach data which includes a description of changes to Contract Documents that proposed Deviation will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. The proposed Deviation does not affect dimensions shown on drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested Deviation.
3. The proposed Deviation will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be readily available for the proposed Deviation.
5. Finishes will not be altered
6. Proposed deviation shall not alter required compliance with agencies having jurisdiction and/or code requirements.

The undersigned further states that the function, appearance, and quality of the proposed Deviation are equivalent or superior to the specified item.

Submitted by:

Subcontractor Signature: _____

Subcontractor Name & Company (print): _____

Address: _____

Date: _____ Telephone: _____

General Contractor Signature: _____

General Contractor Name & Company (print): _____

Address: _____

Date: _____ Telephone: _____

Attachments: _____

For use by Architect:

☐ Accepted.

☐ Not Accepted.

☐ Accepted as noted.

☐ Received too late.

By: _____

Date: _____

Remarks: _____

END OF DOCUMENT

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Section 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Promptly implement change order procedures as required specified for review by the **Architect**.
 - 1. Provide full written data required to evaluate changes.
 - 2. Maintain detailed records of work done on time-and-material/force account basis.
 - 3. Provide full documentation to **Architect** on request.
- C. Designate in writing, names of authorized members of **General Contractor's** organization who are authorized to accept changes in Work, and who are responsible for informing others in **General Contractor's** employ of authorization of changes in Work.
- D. **Owner** will designate person who is authorized to execute Change Orders.

1.2 RELATED REQUIREMENTS

- A. Conditions of the Contract:
 - 1. Methods of determining cost or credit to **Owner** resulting from changes in Work made on time-and-material/force account basis.
 - 2. **General Contractor's** claims for additional costs.

1.3 DEFINITIONS

- A. Proposal Request: See General Conditions & attached document.
- B. Change Order: Written order to **General Contractor**, signed by **Owner** and **Architect**, amending Contract Documents as described.
 - 1. Authorizes **General Contractor** to proceed with change altering Contract Sum, Contract Time or both.

1.4 CLARIFICATION documents for use by General Contractor and Architect:

- A. CLARIFICATON: Architect's Supplemental Instructions
 - 1. Clarification form is attached and part of this Section.
 - a. **Architect** shall, at their discretion, provide supplemental instructions during the course of construction which can assist the **General Contractor** in their work, such instructions shall be in writing and/or graphical representation (supplemental drawings) and accompanied by the Clarification form.
 - b. Clarifications are intended to not increase or decrease the project costs, if the **General Contractor** determines that the project cost will change, then written notification will be required to be issued and approved by the **Owner** and **Architect** prior to implementation of the Clarification.
 - c. Such change request shall be issued as a Proposed Change Order by the **General Contractor** for review and approval.

B. RFI: Contractors Request for Information/Interpretation

1. An RFI is a written request prepared by **General Contractor** asking the **Architect** to provide additional information they deem necessary to clarify an item which the **General Contractor** and/or their subcontractor feels is not clearly shown or called for in the Drawings or Specifications, or to address issues which have arisen due to field conditions.
2. The RFI shall reference all the applicable Contract Documents, including specification section, detail, page numbers, drawing numbers, and sheet numbers, etc. and shall be numbered sequentially.
 - a. The RFI shall include suggestions and/or interpretations of the issue raised by the RFI if possible.
 - b. An RFI cannot modify the Contract Sum and/or the Contract time.
3. The **Architect** and their consultants will respond to an RFI in reasonable promptness directly correlated to the complexity of the RFI.

1.5 COST REQUEST BULLETIN – CRB

A. Document: CRB

1. Whether referred to as Cost Request Bulletin, Proposal Request or Request For Proposal, they shall be interchangeable.

B. **Owner**, via **Architect**, may initiate changes by submitting a Cost Request Bulletin to the **General Contractor**. Request will include:

1. Detailed description of Change, Products, and location of change in Project.
2. Supplementary or revised Drawings and Specifications.
3. Projected time span for making change, and specific statement as to whether overtime work is, or is not, authorized.
4. Specific period of time during which requested price would be considered valid.
5. Such request is for information only, and is not an instruction to execute changes, nor to stop Work in progress.

C. **General Contractor** may initiate changes by submitting written Proposal to **Owner**, via **Architect** containing:

1. Description of proposed changes.
 - a. Related contract drawing, detail, etc.
 - b. Related specification section and item
2. Statement of reason for requested changes.
3. Statement of effect on Contract Sum and Contract Time.
4. Statement of effect on work of separate contractors.
5. Documentation supporting any proposed change in Contract Sum or Contract Time, as appropriate.
 - a. Itemize list of material unit costs, taxes, profit, etc.

1.6 CONSTRUCTION CHANGE DIRECTIVE - CCD

- A. In lieu of Cost Request Bulletin, the **Architect** may issue a Construction Change Authorization for **General Contractor** to proceed with a change for subsequent inclusion in a Change Order.

- B. Authorization will describe changes in Work, both additions and deletions, with attachments of revised Contract Documents to define details of change, and will designate method of determining any change in Contract Sum and any change in Contract Time.
- C. **Owner** and **Architect** will sign and date Construction Change Directive as authorization for **General Contractor** to proceed with changes after **General Contractor** has provided acceptable cost evaluation.

1.7 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump-sum proposal and for each unit price which has not previously been established with sufficient substantiating data to allow **Owner** and **Architect** to evaluate quotation.
- B. On request provide additional data to support time and cost computations. Submit data in itemized format, with breakdowns conforming to standard industry categories of work, and including the following:
 - 1. Labor required.
 - 2. Equipment required.
 - 3. Products required.
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 - 4. Taxes, insurance and bonds.
 - 5. Credit for work deleted from Contract, similarly documented.
 - 6. Overhead and profit.
 - 7. Justification for any change in Contract Time.
- C. Support each claim for additional costs, and for work done on time-and-material/force account basis, with documentation as required for lump-sum proposal, plus additional information:
 - 1. Name of **Owner's** authorized agent who ordered the work, and date of order.
 - 2. Dates and times work was performed, and by whom.
 - 3. Time record, summary of hours worked, and hourly rates paid.
 - 4. Receipts and invoices for:
 - a. Equipment used, listing dates and times of use.
 - b. Products used, listing of quantities.
 - c. Subcontracts.
- D. Document requests for product substitutions shall be completed as specified in Division 1 for substitution, deviation and/or submittal procedures.
 - 1. Substitution of any structural materials will require a Change Order form be processed.

1.8 CHANGE ORDERS - CO

- A. Preparation/General:
 - 1. **General Contractor** will prepare Change Orders for review by **Owner** and **Architect**.
 - 2. Change Order form, see herein attached form CO.
 - 3. Change Order will describe changes in Work, both additions and deletions, with attachments of revised Contract Documents to define details of change.

4. Change Order will provide accounting of adjustment in Contract Sum and in Contract Time.
- B. Lump-Sum/Fixed Price Change Order
1. Content of Change Orders will be based on, either:
 - a. **Owner's** Cost Request Bulletin and **General Contractor's** responsive Proposal as mutually agreed between **Owner** and **General Contractor**.
 - b. **General Contractor's** Proposal for change, as approved by **Owner**.
 2. **Owner** and the **Architect** will sign and date Change Order as authorization for **General Contractor** to proceed with changes after **General Contractor** has provided acceptable cost evaluation.
 3. **General Contractor** will sign and date Change Order to indicate agreement with terms therein.
- C. Unit Price Change Order
1. Content of Change Orders will be based on, either:
 - a. Definition of scope of required changes.
 - b. **General Contractor's** Proposal for change, as approved by **Owner**, and **Architect**.
 - c. Continuous survey and monitoring by **Owner's** Representative of all work.
 2. Amounts of unit prices to be:
 - a. Any stated in Bid Form or Agreement.
 - b. Those mutually agreed upon between **Owner** and **General Contractor**.
 3. When quantities of each item affected by Change Order can be determined prior to start of work:
 - a. **Owner** and the **Architect** will sign and date Change Order as authorization for **General Contractor** to proceed with Changes.
 - b. **General Contractor** will sign and date Change Order to indicate agreement with terms therein.
 4. When quantities of items cannot be determined prior to start of work; and with pre-approval by the **Owner** and the **Architect**.
 - a. **Owner** will issue through the **Architect** a Construction Change Directive directing **General Contractor** to proceed with change on basis of unit prices, and will cite applicable unit prices.
 - b. **General Contractor** shall provide continuous on-site monitoring of all work and keeping records of all labor, materials and time required for completion.
 - c. At completion of change, **Owner** and **Architect** shall review cost of such work based on unit prices and quantities used.
 - d. **General Contractor** shall submit documentation to establish number of units of each item as well as any claim for change in Contract Time.
 - e. **Owner** and the **Architect** shall sign and date Change Order to establish change in Contract Sum and in Contract Time upon approval of **General Contractor's** breakdown of costs and time frame.
 - f. **General Contractor** shall sign and date Change Order to indicate agreement with terms therein.

1.9 CORRELATION WITH CONTRACTOR SUBMITTALS

- A. Periodically revised Schedule of Values and Request for Payment forms to record each change as a separate item of Work, and to record adjusted Contract Sum.
- B. Periodically revise Construction Schedule to reflect each change in Contract Time.
 - 1. Revise schedules to show changes for other items of work affected by changes.
- C. Upon completion of work under Change Order, enter pertinent changes in Record Documents.

PART 2 - **PRODUCTS**

Not Used

PART 3 - **EXECUTION**

Not Used

END OF SECTION 01 26 00

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CLARIFICATION # ###

Project: South San Francisco Unified School District
South San Francisco High School
ALTERATIONS TO ROOMS C-3 & C-4
19six #: 24411.01
DSA #: 01-122274
Date: [Click or tap to enter a date.](#)

The Work noted on this form and attachments shall be carried out in accordance with the following clarifications issued in accordance with the Contract Documents without change to the Contract Sum or Contract Time.

Item #1: [Brief Description Identifier](#) [Detailed description.](#)

Attachments: [List attachments](#)

Distribution:
[Name, Company](#)

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COST REQUEST BULLETIN # ###

Project: South San Francisco Unified School District
South San Francisco High School
ALTERATIONS TO ROOMS C-3 & C-4
19six #: 24411.01
DSA #: 01-122274

Date: [Click or tap to enter a date.](#)

Please submit an itemized quote for the adjustment to Contract Sum and Contract Time for the following change in the Work. Be clear and complete to expedite approval. The scope of the Work will be modified only as herein specifically set forth and in all other respects remains unaltered. Your quotation is to be for the complete compensation and time extension including field and office overhead, profit, supervision and any other costs. *You are not authorized to proceed with this change.*

Item #1: **Brief Description Identifier** [Detailed description.](#)

Reason: [Click or tap here to enter text.](#)

Attachments: [List attachments](#)

Distribution:
[Name, Company](#)

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CHANGE ORDER # ###

Project: South San Francisco Unified School District
 South San Francisco High School
ALTERATIONS TO ROOMS C-3 & C-4
 19six #: 24411.01
 Owner #: ###

Contractor: [Enter Contractor Company Name](#)
[Contractor Street Address](#)
[Contractor City, State & Zip Code](#)

DSA #: 01-122274

Date: [Click or tap to enter a date.](#)

The scope of work will be modified only as herein specifically set forth and in all other respects remains unaltered.

Item #1: [Brief Description Identifier](#) [Detailed description](#)

Reason: [Click or tap here to enter text.](#)

Back-up: [Click or tap here to enter text.](#)

Change in Contract Sum for this item:	Choose an item. \$	Value
Change in Contract Time for this item:	Choose an item. ###	Days

Original Contract Choose an item. :	\$	Value
---	----	-------

Contract Choose an item. prior to this Change Order:	\$	Value
--	----	-------

Contract Choose an item. is Choose an item. by this Change Order by:	\$	Value
--	----	-------

Contract Choose an item. will be Choose an item. to:	\$	Value
--	----	-------

Original Substantial Completion date:	Click or tap to enter a date.
---------------------------------------	---

Completion date prior to this CO:	Click or tap to enter a date.
-----------------------------------	---

New Completion date after this Change Order:	Click or tap to enter a date.
--	---

Contractor and Owner acknowledge that the change in Contract Sum and Contract Time set forth above constitute the complete compensation and time extension for this change in the work including, but not limited to, Contractor's field and office overhead, profit and supervision and Owner's project expenses, inspection and administration costs.

Accepted by:

Authorized by:

Date

Date

(Print Name and Title)

[Enter Contractor Company Name](#)

CONTRACTOR

(Print Name and Title)

[Enter Owner Entity Name](#)

OWNER

Recommend Approval by:

[Click or tap to enter a date](#)

Date

[Choose an item.](#), [Choose an item.](#)

(Print Name and Title)

19six Architects

SECTION 01 29 73 – SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 General Requirements apply to the work of this Section.
- B. Submit a schedule of values to the **Owner** and **Architect** within 14 days after receiving written Notice to Proceed.
- C. Upon request by **Owner** or **Architect**, support values given with data substantiating their correctness.
- D. Use schedule of values only as basis for **General Contractor's** application for payment.
- E. Revise schedule of values at such time as trade contracts are finalized and/or at the time a Change Order is approved.

1.2 FORM OF SUBMITTAL

- A. Submit typed schedule on AIA Form G703 – Most current adopted edition.
 - 1. Format: Table of Contents of this Project Manual, with modifications as approved; identify each line item with number and title of major specification sections.
 - 2. Include a separate line item amount for **General Contractor** overhead and profit.
 - 3. Revise schedule to list change orders for each Application for Payment.
- B. Use table of contents for this Specification as basis for format for listing costs of work specified in Divisions 2 thru 49.

1.3 PREPARING SCHEDULE OF VALUES

- A. Make the sum of the costs listed on the original or revised schedule of values, equal to the total contract sum.
- B. Separately itemize all approved Change Orders to adjust contract sum.
- C. Do not include **General Contractor** mark-up of line items or trades with the individual line items or trades.
 - 1. Include that mark-up as part of separate line item by itself.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION 01 29 73

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SECTION 01 29 76 – PROGRESS PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 GENERAL

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.

1.2 UNIT PRICES

- A. Unless otherwise specified, all unit prices quoted in the Bid Form for additions to or deductions from the Work are the installed costs of products, including overhead and profit, taxes, and other costs, so that they are the complete price to the **Owner**. These unit prices shall not apply to Work which the **General Contractor** may elect to do or not to do, for the sake of their own convenience, nor shall they apply to Work required to be performed in order to correct errors committed by the **General Contractor**.
- B. All unit prices shall be valid and in force during the life of the Contract and shall be reconciled with the Contract Sum, in accordance with the GENERAL CONDITIONS, before filing of the Notice of Completion.

1.3 APPLICATIONS FOR PAYMENTS

- A. General: Submit notarized Applications for Payment to the **Architect** in accordance with the schedule established by the GENERAL CONDITIONS and the Agreement between the **Owner** and **General Contractor**.
- B. Release of Liens: **General Contractor** shall submit with each Application for Payment a *conditional lien* release warranting that title to all Work, labor, materials and equipment covered by the invoice is free and clear of all liens, claims, security interests or encumbrances. With each subsequent Application for Payment, **General Contractor** shall submit notarized *unconditional lien releases* for the previous invoice.
- C. Format and Data Required: Submit itemized applications typed on AIA Document G702-Most current adopted edition, "Application and Certificate for Payment", and Continuation Sheet G703-Most current adopted edition. Substitutions of this form will not be accepted.
 - 1. Line items and dollar values shall be from the schedule of values accepted by the **Architect**; refer to Division 1 schedule of values requirements.
 - 2. Include names, categories of Work, and amounts for Sub-contractors.
 - 3. Overhead and profit shall be a line item each month for the **General Contractor** and Subcontractor on their G703 sheets.
- D. Preparation of Application for Each Progress Payment: Substitutions of This Form will not be accepted.
 - 1. Application Form (AIA Document G702- most current adopted edition, confirm with Architect):
 - a. Fill in required information, including that for Change Orders executed prior to the date submittal of application.

- b. Fill in summary of dollar values to agree with the respective totals indicated on the Continuation Sheets.
 - c. Execute certification with the notarized signature of a person authorized to bind the contracting firm in such matters.
 2. Continuation Sheets (AIA Document G703- most current edition, confirm with **Architect**):
 - a. Fill in total list of scheduled component items of Work, with item number and the schedule dollar value for each item.
 - b. Fill in the dollar value in each column for each scheduled line item when Work has been performed or products stored as approved. Round off values to nearest dollar, unless otherwise specified for the schedule of values.
 - c. At the end of the Continuation Sheets list each Change Order executed prior to the date of submission. List by Change Order number, description, and breakdown of costs as for an original component item of Work.
- E. Substantiating Data for Progress Payments:
 1. When substantiating data are required, submit suitable information as specified in Division 1 progress payment procedure requirements with a cover letter identifying:
 - a. Project.
 - b. Application number and date.
 - c. Detailed list of enclosures.
 2. Submit one copy of data and cover letter for each copy of application.
- F. Preparation of Application for Final Payment:
 1. Fill in application form as specified for progress payments.
 2. Use Continuation Sheets for presenting the final statement of accounting.
 3. Full unconditional lien releases.
- G. Submittal Procedure:
 1. Submit Applications for Payment for review by **Owner's** On-Site Representative and certification by the **Architect** at the times stipulated in the Agreement.
 2. Number: Six copies of each application with original wet signature on each.

1.4 CHANGE ORDERS

- A. List all Approved Change Orders on AIA Document G702 – most current edition, confirm with **Architect** (in space provided).
- B. Backup data submitted with Applications for Payment may be used as basis for approving or rejecting costs submitted in Change Orders.

PART 2 - **PRODUCTS**

Not Used

PART 3 - **EXECUTION**

Not Used

END OF SECTION 01 29 76

SECTION 01 31 13 – PROJECT COORDINATION

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Coordination of all aspects of construction, including, but not limited to;
 - a. Construction
 - b. Testing
 - c. Inspections
 - d. Mockups
 - 2. Coordination of all aspects of demolition

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC), www.bsc.ca.gov current edition at time of permit issuance.
- B. Title 24, California Code of Regulations, California Building Standards Commission .
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. CBC Energy Code, California Code of Regulations, Title 24, Part 6, California Building Standards Commission.
- E. Title 24, Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types.

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:
 - 1. Comply with manufacturer's standards.
 - 2. Comply with Building Code.
 - 3. Comply with requirements of each specification section.
 - 4. Comply with requirements of drawings.

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Site mock-up: refer to "Mock-Up" heading of each specification section.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Coordinate that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation, testing, mockups, inspections, etc. as required to comply with Contract requirements.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Refer to each specification section.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Construction
 - 2. Demolition
- B. Related Sections include, but are not limited to the following:
 - 1. All specification sections

1.11 OPERATION AND MAINTENANCE DATA

- A. Coordinate that all documentation is submitted as part of project closeout.
- B. Coordinate that commissioning is done and documented to illustrate compliance with design criteria.
- C. Comply with Division 1 closeout submittal procedure requirements.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with all trades and commissioning personal, etc.
- B. Schedule required testing, inspections, mockup fabrication, etc.
- C. **General Contractor** shall coordinate slab vapor emission and PH testing of concrete floors and ensure that concrete treatment within criteria of finish flooring is complete prior to the installation of finish flooring as herein specified.

1.13 GENERAL SYSTEM DESCRIPTION

- A. Duties of the **General Contractor**:
 - 1. **General Contractor** shall maintain approved construction drawings, specifications, addendums, change orders and other documents supplied by **Architect** on site at all times.
 - 2. Coordinate the work of all Subcontractors.
 - 3. Establish on-site lines of authority and communication.
 - a. Schedule and conduct construction progress meetings at intervals agreed upon in Bidding Documents, but not to exceed monthly.
 - 1) Invited attendees shall include;
 - a) **Owner**
 - b) **Architect**
 - c) Subcontractors when needed to address specific issues.
 - 2) **General Contractor** shall keep minutes of all construction progress meetings and submit to **Owner** and **Architect** within 72 hours for review and comment by **Architect** and **Owner**.
 - a) Meeting minutes shall be finalized prior to next meeting.
 - 3) Refer to Section 01 31 19 Project Meetings
 - b. Submit construction schedule and schedule updates for review by the **Architect** and **Owner** at meetings and other times as directed by Division 1 – General Requirements.
 - 4. Construction Schedules:
 - a. Submit construction schedule and required updates at intervals required by the **Owner**.
 - b. Prepare detailed schedule of operations of all subcontractors/trades.
 - 1) Provide list of subcontracts that state company name, address, phone number and specifications section of work.
 - c. Monitor construction schedules as work progresses:
 - 1) Identify potential variances between scheduled probable completion dates. Submit schedule updates to **Architect**, once each month with each Application for Payment.
 - 2) Recommend to **Owner** adjustments in schedule to meet required completion date, and submit schedule updates to **Architect**.
 - d. Observe work to monitor compliance with schedule.

- 1) Verify that labor and equipment are adequate for the work and the schedule.
 - 2) Verify that product deliveries are adequate to maintain schedule.
 - 3) Report noncompliance to **Owner**, with recommendation for remedy.
- e. Comply with requirements of Division 1 – General Requirements.
5. Temporary Facilities:
 - a. Allocate space as available for each Subcontractor within construction area.
 - b. Monitor use of temporary utilities.
 - c. Verify that adequate services are provided to comply with requirements for work and climatic conditions.
 - d. Verify proper maintenance and operation of temporary facilities.
 - e. Administer traffic controls where construction operations infringe upon the normal flow of traffic about the site.
 - f. Refer to Division 1 for temporary facilities and controls requirements.
 - g. Comply with requirements of Division 1 – General Requirements.
6. Cost Control:
 - a. Monitor and record actual costs, and estimates for completed work.
 - b. Incorporate approved changes as they occur.
 - c. Maintain cost accounting records for authorized work.
 - d. Develop and implement procedure for review and processing of applications for progress and final payments: Submit Applications for Payment to **Architect** for certification to **Owner** for payment.
 - e. Comply with requirements of Division 1 – General Requirements.
7. Changes:
 - a. Recommend necessary or desirable changes to **Owner** and **Architect**.
 - b. Review Subcontractor's requests for changes and for substitutions; submit recommendation to **Owner** and **Architect**.
 - c. Process change orders to Subcontractors.
 - d. Comply with requirements of Division 1 – General Requirements.
8. Permits and Fees: Verify that Subcontractors have obtained required permits for inspections and for temporary facilities.
9. Interpretations of Contract Documents:
 - a. Consult with **Architect** to obtain interpretations.
 - b. Assist in resolution of questions which may arise.
 - c. Transmit written interpretations to concerned parties.
10. Administer processing of shop drawings, product data and samples.
11. Maintain reports and records at site:
 - a. Daily log of progress of work, available to **Architect** and **Owner**.
 - b. Records
 - 1) Contracts

- 2) Purchases
 - 3) Materials and equipment records.
 - 4) Applicable handbooks, codes and standards.
 - c. Obtain information from Subcontractors, and maintain record documents.
 - d. At completion of project, deliver all necessary records to **Owner**.
 - e. Assemble documentation for handling of claims and disputes.
 - f. Comply with requirements of Division 1 – General Requirements.
12. Verify that specified cleaning is done during progress of the work and at completion of project.
13. Start-up:
- a. Direct and checkout of utilities, operational systems and equipment.
 - b. Assist in the initial start-up and testing.
 - c. Record dates of start of operation of systems and equipment.
 - d. Coordinate with Division 1 as to approved time to start warranty period for equipment put into service.
- 1) Provide to **Owner** written notice of proposed beginning of warranty period for equipment put into service for review and subsequent approval.
14. Substantial Completion:
- a. Coordinate with Division 1 regarding approved process.
15. Final Completion:
- a. Coordinate with Division 1 regarding approved process.

PART 2 – **PRODUCTS**

Not Used

PART 3 – **EXECUTION**

Not Used

END OF SECTION 01 31 13

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SECTION 01 31 19 – PROJECT MEETINGS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. **General Contractor** shall schedule and administer pre-construction meeting, periodic progress meetings, and specially called meetings throughout progress of the work, and will:
 - 1. Prepare & distribute agenda to all participants 48 hours prior to scheduled meeting.
 - 2. Distribute written notice of each meeting four days in advance of meeting date.
 - 3. Make physical arrangements for meetings.
 - 4. Preside at meetings.
 - 5. Record the minutes; include significant proceedings and decisions.
 - 6. Reproduce and distribute copies of minutes within two working days after each meeting and distribute to:
 - a. Participants in the meeting.
 - b. Parties affected by decisions made at meeting.
 - c. **Owner**
 - d. **Architect**
- C. Representatives of **General Contractor**, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of entity each represents.
- D. Project **Architect** and/or representative of **Architect** shall attend meetings called by **Owner** to ascertain that Work is expedited consistent with Contract Documents and construction schedules.

1.2 PRE-CONSTRUCTION MEETINGS

- A. Timing: Within 14 days after date of Notice to Proceed.
- B. Location: Central site, convenient for all parties, approved by **Owner**.
- C. Attendance:
 - 1. **Owner** representatives.
 - 2. Project **Architect** and/or representatives and their professional consultants, at **Architect's** option.
 - 3. **General Contractor's** Superintendent, Project Manager and Foreman.
 - 4. Major Subcontractors.
 - 5. Major suppliers.
 - 6. Others as appropriate.
- D. Suggested Agenda:
 - 1. Use of Premises:
 - a. Site access
 - b. Site security

- c. Utility hook-up point of connections (POC's)
 - d. Site specific safety issues
 - e. Vehicular and pedestrian traffic
 - f. Emergency vehicle access (ambulance and fire)
 - g. Material delivery, staging/lay-down area(s)
 - h. Noise, dust control and SWPPP requirements
 - i. Other jurisdictional agency requirements
 - j. Hours of work
 - k. Project signage
2. Distribution of Project Directory including names, email addresses and phone numbers of all project participants.
3. Distribution of list of major subcontractors and suppliers.
4. Project Construction Schedule:
 - a. Timing of submission of Construction Schedule updates.
 - b. 3-week look-a-head schedule.
5. Scheduling of subsequent **Owner/Architect/General Contractor** meetings.
6. Review of all forms of "change" documentation:
 - a. Clarification
 - b. Request for Information (RFI).
 - c. Cost Request Bulletin (CRB).
 - d. Construction Change Directive (CCD).
 - e. Change Order (CO).
 - f. Etc.
7. Review of all form templates included in Specifications:
 - a. Submittal Cover Sheet.
 - b. DSA forms
8. Pay Application:
 - a. Level of detail expected in the Schedule of Values to be included with each Pay Application.
 - b. Timing for submission of "pencil draft" of Pay Application for preliminary review by Project Inspector, **Owner** Representative and **Architect**.
9. DSA Closeout process
 - a. Required documentation to be provided to the **Architect** throughout the course of construction, (special inspection reports, weigh-master's certificates, prism test results, concrete mix designs, mill certificates etc.)
 - b. Timing of the submission of DSA-6 forms (AFTER all Change Orders are approved)
 - c. Recommendation of withholding of payments to ensure participation in DSA closeout process
10. Project Coordination
 - a. Critical work sequencing.
 - b. Major equipment deliveries and priorities.

- c. Designation of responsible personnel.
- 11. Use of Newforma construction administration software:
 - a. Document routing protocols.
 - b. Submittal and RFI processes.
 - c. Information exchange website.
- 12. Distribution of Contract Documents.
- 13. Procedures for maintaining Record Documents.
- E. A separate pre-construction meeting shall be held for roofing and other items as identified in Divisions 2 through 49 sections.

1.3 PROGRESS MEETINGS AND SPECIALLY CALLED MEETINGS

- A. **General Contractor** shall schedule regular periodic meetings, as required.
- B. **Owner** or **Architect** shall hold specially called meetings as required by progress of work.
- C. Location of meetings: Project field office of **General Contractor**, except as otherwise required.
- D. Special technical meetings: Meetings will be held prior to beginning work under various technical specifications:
 - 1. Called by **Owner** and/or **Architect** at their option.
- E. Attendance:
 - 1. **General Contractor's** project representative and job superintendent.
 - 2. Project **Architect**, and their professional consultant as needed, at their option.
 - 3. Subcontractors as appropriate to agenda.
 - 4. Suppliers as appropriate to agenda.
 - 5. Others.
- F. Suggested Agenda:
 - 1. Review and approval of minutes of previous meeting.
 - 2. Review of work progress since previous meeting.
 - 3. Field observations, problems, conflicts.
 - 4. Problems which impede Construction Schedule.
 - 5. Review of off-site fabrication, delivery schedules.
 - 6. Corrective measures and procedures to regain projected schedule.
 - 7. Revisions to Construction Schedule.
 - 8. Progress, schedule, during succeeding work period.
 - 9. Coordination of schedules.
 - 10. Review submittal schedules; expedite as required.
 - 11. Maintenance of quality standards.
 - 12. Pending changes and substitutions.
 - 13. Review bi-weekly email report from DSA Project Inspector
 - a. Tests & inspections
 - b. Field Trip Notes
 - c. Deviations or issues with construction

14. Review proposed changes for:
 - a. Effect on Construction Schedule and on completion date.
 - b. Effect on other contracts of Project.
15. Other business.

1.4 FINAL CLOSEOUT MEETING

- A. Refer to Division 1 for protection and cleaning requirements.

PART 2 - **PRODUCTS**

Not Used

PART 3 - **EXECUTION**

Not Used

END OF SECTION 01 31 19

SECTION 01 32 16 – CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Within fifteen (15) days after award of the Contract, submit to the **Architect** estimated construction progress schedule for the Work, with sub schedules of related activities essential to its progress. Submit revised progress schedules periodically, and with monthly Applications for Payment.

1.2 FORMAT

- A. **Bar Chart or CPM Schedule:** Prepare Progress Schedule as a horizontal bar chart with separate bar for each major portion of Work or operation, identifying first work-day of each week or as a network analysis system using the critical path method, as outlined in The Associated General Contractors of America (AGC) publication "The Use of CPM in Construction - A Manual for General Contractors".
- B. **Sequence, Scale and Size:** Provide listing in the chronological order of the start of each item of Work. Prepare at a scale to provide space for notations and revisions. Make sheet size appropriate to the size of the project, in multiples of 8-1/2 x 11 inches.

1.3 CONTENT

- A. **General:** Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction. Coordinate content with Schedule of Values specified in Division 1.
- B. **Phases:** Identify work of separate stages and other logically grouped activities. Provide sub-schedules for each stage of Work as required in Division 1 summary of work. Provide sub-schedules to define critical portions of the entire Schedule.
- C. **Items of Work:** Identify each item by specification Section number. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- D. **Required Submittals:** Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Architect/Engineer. Indicate decision date for selection of finishes or products.

1.4 REVISIONS TO SCHEDULES

- A. Indicate progress of each activity to date of submittal, and projected completion date of each activity. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

- 3.1 Submittals: After review, resubmit required revised data within ten (10) days. Submit revised Progress Schedules with each Application for Payment. Provide the number of opaque reproductions which General Contractor requires, plus two (2) copies which will be retained by the Architect and Owner.
- 3.2 Distribution: Distribute copies of reviewed Schedules to project site file, Subcontractors, suppliers, and other concerned parties. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in Schedules.

END OF SECTION 01 32 16

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Ensure that specified products are furnished and installed in accordance with design intent by following procedures established herein for advance submittal of design data for its review by the **Architect** and their **Engineers** and consultants.
 - a. Refer to Division 1 for sustainability, commissioning, and O&M Manual submittal requirements.
- C. The following forms are included within the scope of this specification section, and shall be used as needed and/or required:
 - 1. Construction:
 - a. Submittal Cover Sheet
 - 1) **General Contractor** shall fill in and provide with all submittals including proper numbering and subsequent numbering.

1.2 QUALITY ASSURANCE

- A. Construction
 - 1. Coordination of submittals:
 - a. **General Contractor** shall:
 - 1) Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.
 - 2) Verify that each item of the submittal conform in all respects with the specified requirements.
 - 3) Place their stamp and signature on each submittal, which shall certify that required coordination of all items has been performed and that the submittal is complete. The stamp and signature from the General Contractor shall signify their approval of the submittal prior to sending it to the Architect for review.
 - a) Submittals without Contractor's stamp and signature will be returned without review.
 - 4) In the event a submittal presented for review by the design team includes any deviations, changes, or substitutions from the contract documents, such change shall be clearly identified and graphically indicated by clouding. If deviations are not highlighted by the contractor and not noted by the design team upon return of

submittal, the General Contractor is still responsible for correcting the deviation, once identified, to comply with the contract documents.

- 5) If a deviation/change/substitution presented requires additional engineering and/or submittal and review by DSA, the General Contractor is responsible for any professional fees/costs incurred by the Owner.
- 6) Make no changes to any submittal after it has been reviewed and the equipment or materials shall not deviate in any way except with review and written acceptance by the **Architect** and approval by DSA, when required. Fabrication or other work performed in advance of review and acceptance approval shall be done entirely at the **General Contractor's** risk.
- 7) Make it their responsibility to ensure there is no conflict with other submittals and to notify the **Architect** in any case where the **General Contractor's** submittal may concern work by another **General Contractor** or the **Architect**.
 - a) The **General Contractor** is solely responsible for coordination of submittals among all related crafts performing the Work.
 - b) The **General Contractor** shall verify that their Sub-Contractors' submittals are complete in every way, meet the requirements of the Contract, and approve them.
- b. The review of the **General Contractor's** submittals shall not relieve the **General Contractor** of responsibility for any error or of any obligation for accuracy of dimensions and details, for agreement with and conformity to the Contract, or responsibility to fulfill the Contract as prescribed. Nor shall such review be considered as approval of any deviation or conflict unless the **Architect** has been expressly advised of the same as set forth immediately above, and the **Architect** has expressly approved such deviation or conflict. The **Architect's** and/or design team's review of submittals does not constitute final acceptance or unqualified approval of items or work proposed or put in place, nor does it constitute acceptance of responsibility for the accuracy, coordination or completeness of submittals.
- c. Minimum requirements for submittals are contained in these Specifications. Additional and/or project-specific requirements may be contained in the Contract. The **General Contractor** is responsible for identifying and providing all required submittals.

1.3 INFORMATION PROVIDED BY DESIGN TEAM

- A. PDF format finish drawing files of site, floor and/or roof plans will be provided to **General Contractor** by **Architect** using the following process:
 1. Written request for specific plans shall be submitted to **Architect**
 2. Upon receipt of request, **Architect** will issue Electronic File Waiver to **General Contractor** to be signed and returned.
 3. Upon receipt of signed Waiver, **Architect** will issue requested files via email or our FTP Site (Sharefile) to **General Contractor** who will distribute as needed to their Subcontractors.
- B. CAD base files may be provided to **General Contractor** by **Architect** using the following process:
 1. Written request for specific plans shall be submitted to **Architect**.

- a. CAD files which will be made available upon request: Floor Plans, Roof Plans, Ceiling Plans, and Exterior Building Elevations.
 - b. Details / Detail sheets will not be made available.
2. Upon receipt of request, **Architect** will issue Electronic File Waiver to **General Contractor** to be signed and returned.
3. Upon receipt of signed Waiver, **Architect** will issue requested files via email or our FTP Site (ShareFile) to **General Contractor** who will distribute as needed to sub-contractors. Sub-contractors shall sign and return waiver to **General Contractor** prior to being issued the CAD files. Copies of the sub-contractor signed waivers shall be forwarded to **Architect** for their records.

PART 2 - PRODUCTS

2.1 SUBMITTALS / SHOP DRAWINGS

A. Construction:

1. General

- a. Shop drawings shall be submitted with sufficient turn-around time to allow adequate time for review and re-submittal and re-review as needed.
 - 1) The **General Contractor** is solely responsible for monitoring the timing of submittals as related to the Construction Schedule, and delivery to the **Architect** for review.
 - 2) Reviewed submittals will be returned to the **General Contractor** via email or Newforma Information Exchange.
 - a) One hard copy of reviewed full size shop drawings (as needed) will be returned via overnight courier or other physical delivery method.
 - 3) No work shall proceed without prior review of shop drawings.
 - a) Copies of all reviewed shop drawings shall be maintained on file at the job site at all times.
 - 4) No materials or equipment associated with shop drawings requiring review shall be delivered to the job site or installed without **Architect's** and their **Engineer's** review.
 - 5) Delay in work caused by late submittals, proceeding with work using un-reviewed shop drawings, or from the necessity of resubmittal shall not affect the contract terms of payment or time.

b. Format

1) Distribution:

- a) All electronic submittals shall be submitted to the **Architect** by email or thru project management program/website, as directed by the Architect.
 - i. If required otherwise by **Owner**, submittals could also be required to be submitted via email or another process to **Owner**.

2) Electronic:

- a) All submittals – drawings and other content shall be submitted to **Architect** in PDF format.
 - i. One PDF file, which shall include the submittal cover sheet and all submittal pages, shall be provided per Submittal.
 - ii. One submittal shall be provided per specification section.
 - a. Separate submittals for individual components/items within a specification section will not be accepted.
 - iii. If required otherwise by **Owner** submittals could also be required to be submitted via email or another process to **Owner**.
 - 3) Hard copies (Structural Steel, Storefront/Window Wall, or other large-format shop drawings only):
 - a. Printed drawings shall be provided when requested by the **Architect**.
 - 1. Quantity: Two
 - b. Drawing sizes shall be full size for all plans and detail sheets, 30 x 42 unless approved otherwise by **Architect**.
 - c. Material samples:
 - 1) Samples shall be submitted via overnight courier or other physical delivery method.
 - 2) Number of samples submitted shall be: 4 minimum
 - a) (4) Four samples includes one for **Architect**, one for **Owner**, one for **General Contractor** and one for subcontractor.
 - i. **General Contractor** shall provide additional samples if they need ones for others not herein listed.
 - b) Physical samples are required to be provided for any product review which includes color selection or review; color selection/review will not be made from digital files.
- B. Submittal package:
- 1. General:
 - a. Each page in submittal and all samples shall bear the Submittal Number, in the format herein indicated.
 - b. A Stamp and signature shall appear on each submittal issued by **General Contractor** to signify they have provided an initial review to insure submittal is in compliance with contract documents and specifications, change orders, RFI's, etc. and acceptable for distribution. Submittals which do not conform to this procedure will be returned un-reviewed.
 - c. Unless otherwise noted within individual specification sections, all portions or items required for the submittal of a section shall be submitted simultaneously in one submittal package under one submittal number. Submittals which do not conform to this procedure will be returned to **General Contractor** un-reviewed.

- d. Certain products which work as assemblies or which need to be coordinated, but which are specified under separate specification sections, will be required to be submitted concurrently; refer to the individual specification sections for additional information as to where this condition will apply. Submittals which do not conform to this procedure will be returned to **General Contractor** un-reviewed.
2. The following items shall be required in all submittal packages:
 - a. Cover Sheet Transmittal Form
 - 1) As herein supplied or containing the same information and provided by **General Contractor**.
 - b. Deviation Request Form if applicable
 - 1) This shall include marked up copy of original Specification section with all areas, items, etc. that deviate from what is being submitted.
3. When identified within a specification section, the following items, as defined below, shall be included in the submittal package:
 - a. Manufacturer Product & Technical Data
 - 1) Manufacturer's data sheets containing product description, physical properties, performance characteristics, VOC Compliance (for items subject to VOC restrictions to meet CalGreen and LEED requirements), and testing compliance references.
 - 2) Product Data sheets should be annotated with the specific specification section and line item for which the product is being proposed.
 - b. Manufacturer MSDS Sheets
 - 1) Manufacturer's current Material Safety Data Sheet,
 - c. Manufacturer Installation Instructions
 - 1) Document including manufacturer's recommended preparation, installation and protection procedures.
 - d. Manufacturer and/or Contractor Warranty
 - 1) Preliminary copy of manufacturer's or installer's additional warranty showing compliance with warranty requirements within a specification section.
 - e. Installer / Applicator Qualifications and References
 - 1) List of Projects meeting criteria indicated in specifications, along with contact names, phone numbers and email addresses for use by **Architect** and **Owner**.
 - f. Manufacturer Approved/Trained/Certified Installer/Applicator
 - 1) Copy of certificate, or letter from manufacturer showing compliance with criteria indicated in specifications.
 - g. Manufacturer Certifications
 - 1) A certificate of compliance from recognized independent testing laboratory, regarding material requirements specified.

h. Manufacturer Test Reports

- 1) Test reports complying with specific requirements identified in each applicable Specification Section.

i. Weld Procedures

- 1) Document showing all weld types, materials and procedures applicable to the project.

j. Mix Designs

- 1) All concrete mix designs proposed for use on the project, stamped by a licensed Civil Engineer, for review and approval; include test data used to establish proportions.

k. Shop Drawings

- 1) Shop drawings shall include, but not be limited to:
 - a) Dimensioned and noted plans, elevations, sections and details as required to show all proposed construction; highlight those items which deviate from drawings and those which are added or deleted items.
 - b) Other items as noted in each specific Specification Section.

l. Engineering Calculations

- 1) When required by specification section, provide engineering calculations, stamped and signed by a **Civil Engineer** licensed in the State of California.

m. Panel Lifting Drawings

- 1) When required by specification section, provide engineered panel lift drawings and details, stamped and signed by a **Civil Engineer** licensed in the State of California.

n. Isometric Drawing

- 1) 3-dimensional drawing of structural system.

o. Samples and Mockups

- 1) Three (3) minimum physical samples of specified products which illustrate materials, color, patterns, equipment, workmanship, etc. and which establish standards by which product(s) and/or work will be judged.
 - a) Sizes shall be of sufficient size to clearly illustrate functional characteristics of product and material and shall confirm to the list below unless otherwise noted within a specific Specification Section:
 - i. Flat or Sheet Products: Minimum 12"x12" square, maximum 24"x24"
 - ii. Linear Products: Minimum 12", maximum 24" long
 - iii. Bulk Products: Minimum one pint, maximum one gallon
 - iv. Tile: Full set to represent each color / color range
 - v. Carpet: Size to show complete pattern
 - b) Quantity shall be sufficient to clearly illustrate the full range of finish, color, texture and pattern of the specified product.

- i. When an exact finish, color, pattern, or texture is not indicated in the Contract Documents, the submittal shall include the manufacturer's choice of colors for **Architect's** review and selection.
 - 2) When required by specifications, erect a mockup at Project site at location acceptable to **Owner** and **Architect**.
 - a) Mock up shall be either a "Product" mock-up or an "Assembly" mock-up, refer to individual specification sections for specific requirements.
 - b) Construct the mockup complete, including work of all trades required in finished work.
 - c) **Architect** and **Owner** shall decide if mockup will be part of finish work.
 - i. Items and assemblies which will be covered up by finish materials shall be separate and not part of finished building.
 - p. Other:
 - 1) As noted and defined within individual Specification Sections.
- C. The following items shall be required to be submitted as part of Project Closeout; refer to Division 1 project close-out requirements for additional information.
 - 1. Operation & Maintenance Manuals
 - 2. Warranties
 - 3. Extra Material / Spare Parts
 - 4. Training Requirements
- D. Deferred Submittals
 - 1. The deferred submittals as indicated in contract documents and/or required by agencies shall be submitted to the appropriate agency by the **General Contractor**.
 - 2. **General Contractor** shall provide complete coordination with all agencies.
 - 3. The deferred submittals submitted to the agencies shall be approved by the Agencies Having Jurisdiction prior to purchase, fabrication and construction of said product/material.
- E. Requirements for Different manufacturer and/or different Subcontractor.
 - 1. The **General Contractor** shall provide re-submittal if product and/or Subcontractor is requested to be changed at **General Contractor's** discretion.
 - 2. Re-submittal initiated by the **General Contractor** shall not be acceptable unless authorized by the **Architect**, and such authorization shall include agreement by the **General Contractor** to pay **Architect** for their time to review new submittal.
 - 3. Fee for this review shall be \$350.00 per hour and payable upon **Architect's** completion of this review.)
- F. Requirements For Commissioning
 - 1. Normal Submittals
 - a. The Commissioning Agent will review normal **General Contractor** submittals applicable to systems being commissioned for compliance with commissioning needs concurrently with A/E reviews.
 - 2. Data for Commissioning

- a. The Commissioning Agent will identify all specific information needed about each piece of commissioned equipment or system.
- b. The **General Contractor** will include this information along with their normal submittals or include the required information with additional Commissioning submittals.
- c. The information requested will typically include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any required tests, fan and pump curves, full factory testing reports, and full warranty information, including all responsibilities of the **Owner** to keep the warranty in force clearly identified. 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 for review by the Commissioning Agent.
- d. The Commissioning Agent may also request further documentation necessary for the commissioning process, refer to Division 1 for commissioning requirements.
- e. The **General Contractor** may be required to provide this data prior to normal submittals.

PART 3 - EXECUTION

3.1 SUBMITTAL SUBMISSION REQUIREMENTS

- A. Within 10 business days following the Notice to Proceed, the **General Contractor** shall submit a Schedule of Submittals showing the anticipated order and number of submittals and the anticipated dates the submittals will be provided for **Architect's** review.
- B. Submittals shall be submitted to **Architect** after Notice to Proceed and at the earliest possible time to allow the most time possible for the **Architect's** review, processing, routing and any subsequent resubmittals needed.
 1. Standard turn-around for most submittals shall be 10 business working days, excluding weekends and holidays.
 - a. Submittals for items such as Structural Steel, Storefront, Window Wall and Flashing may take considerably longer than 10 business working days.
 - b. If a significant number of submittals are provided by General Contractor to Architect at one time, discussions between General Contractor and Architect will determine submittal review priorities as standard 10 business working day turn-around times may not apply.
- C. Submittal Routing
 1. The time necessary for physical routing via: mail, delivery service, etc. including the day(s) sent and the day(s) received shall not be included in the review time by the **Architect** and/or their Consultants.
- D. All submittals shall be accompanied by letter of transmittal addressed to **Architect** and include a Submittal Cover Sheet.
 1. Cover sheet shall include **Architect's** project number, Project name, **General Contractor's** company name, subcontractor's company name and submittal number formatted as specified below.

2. Cover sheet shall include index of items submitted, properly identified with Architectural Document Drawing Numbers, etc.

E. Submittal Numbering

1. Indicate Submittal section, number and revision number, in that order.
2. Numbering examples

a. First submittal for a given section:

1) First Submittal

<u>Section</u>	<u>Number</u>	<u>Revision</u>
03 30 00	01	00

2) Second Submittal

<u>Section</u>	<u>Number</u>	<u>Revision</u>
03 30 00	01	01

3) Third Submittal and not requiring a resubmittal

<u>Section</u>	<u>Number</u>	<u>Revision</u>
03 30 00	01	02

Note: The submittal number must stay the same for all subsequent resubmittals of a submittal package. The only number that changes is the Revision number.

b. When allowed by the **Architect**, a subsequent submittal for same section number but different item would look like this:

1) First initial Submittal

<u>Section</u>	<u>Number</u>	<u>Revision</u>
03 30 00	02	00

2) Second Submittal

<u>Section</u>	<u>Number</u>	<u>Revision</u>
03 30 00	02	01

3) Third Submittal and not requiring a resubmittal

<u>Section</u>	<u>Number</u>	<u>Revision</u>
03 30 00	02	02

F. **Architect** shall review submittals for conformance with design concepts of project and review by **Architect** covers only such conformance.

1. Effort will be made by **Architect** to discover any errors, but responsibility for accuracy and correctness of all submittals shall be the **General Contractor's**.

G. Review of submittals will be general and shall not relieve **General Contractor** from responsibility for proper fitting and construction of Work, nor from furnishing materials and work required by Contract, which may not be indicated on submittals when reviewed.

H. No portion of Work requiring submittals shall be commenced until **Architect** has reviewed submittal.

1. All such portions of Work shall be in accordance with reviewed submittals.

I. Submittal will be reviewed and stamped by the Architect as:

1. "No exceptions taken" (NET),

2. "Furnish as Noted" (FAN),
3. "Revise and Resubmit" (R&R),
4. "Rejected" (REJ),
5. "Other"
6. Terms are defined as follows:
 - a. No Exceptions Taken (NET): Accepted subject to its compatibility with future submittals and additional partial submittals for portions of the work not covered in this submittal. Does not constitute approval or deletion of specified or required items not shown in the partial submittal.
 - b. Furnish as Noted (FAN): The submitted item is found to be in conformance with the contract documents with the exceptions of a few minor clarifications, those clarifications maybe noted and the submittal returned with no further actions. No resubmittal required.
 - c. Revise and resubmit (R&R): The Submitted item is NOT found to conform with the construction documents, the submitted item will be returned with comments stating how the submitted item does not conform. Rejected because of major inconsistencies or errors which shall be resolved or corrected by the Contractor prior to subsequent review by the Architect. A further re-submittal is required by the contractor in order to construct this portion of the project.
 - d. Rejected (REJ): Submitted material does not conform to plans and specifications in major respect. For example, wrong size, model, capacity or material. Resubmit.
 - e. Other: May indicate the following:
 - f. Submit specified item (SSI): Submit to the Architect the items indicated for review. The submittal review requires additional information that does not need to be submitted alongside the original submittal.
 - g. Not reviewed (NR): Returned without Architect's review if item is not applicable or has been reviewed previously.

3.2 SEQUENCE OF SUBMITTALS

A. FIRST SUBMITTAL

1. The **General Contractor** shall provide first submittal package review by Architect and their Consultants.
 - a. Unless otherwise noted within individual specification sections, all portions or items required for the submittal of a section shall be submitted simultaneously in one submittal package under one submittal number. Submittals which do not conform to this procedure will be returned un-reviewed.
 - b. Certain products which work as assemblies or which need to be coordinated, but which are specified under separate specification sections, will be required to be submitted concurrently; refer to the individual specification sections for additional information as to where this condition will apply. Submittals which do not conform to this procedure will be returned to un-reviewed.

B. FIRST RESUBMITTAL (Second overall submittal)

1. The **General Contractor** shall submit a modified submittal based upon comments derived from "First Submittal."

- a. Resubmittals shall address all comments from the **Architect**, and their Consultants. Resubmittals shall consist of only those portions of the original submittal that have been returned and marked "REVISE AND RESUBMIT" or "REJECTED" and for which the resubmittal is required.
 - b. Resubmittal of Shop Drawings necessitated by required corrections shall not be a cause for extension of time. The **General Contractor** shall direct specific attention in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than the corrections requested on previous submittals.
 - c. Revised submittal shall maintain same products and manufacturers from "First Submittal" unless requested otherwise by **Architect**.
 - d. The first resubmittal review by **Architect** shall be deemed to be the last. If subsequent submission is required for this specific item, it is due to **General Contractor's** failure to provide an accurate resubmittal. In this case, the **Architect** shall consider review of the second resubmittal as an additional service.
 - 1) The **General Contractor** is responsible for the **Architect's** review costs for each resubmittal in excess of the first resubmittal. These costs will be back charged to the **General Contractor** by the **Owner**.
- C. SECOND RESUBMITTAL (Third overall submittal)
1. The **General Contractor** shall provide this "Second Resubmittal" only if requested by **Architect** and/or **Architect's** consultant.
 2. If this "Second Resubmittal" is initiated by the **General Contractor**, it shall not be acceptable unless authorized by the **Architect**, and such authorization shall include agreement by the **General Contractor** to pay **Architect** for their time to review resubmittal.
 - a. A retainer of \$750.00 shall be paid prior to **Architect's** review.
 - b. A fee for this review shall be at \$250.00 per hour and payable upon **Architect's** completion of this review.)

END OF SECTION 01 33 00

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SUBMITTAL COVER SHEET

PROJECT NAME:
South San Francisco High School C3 & C4 Alterations

SUBMITTAL NUMBER:
SUBMITTAL # - SECTION # - REVISION #

PROJECT #: 24411.01

GENERAL CONTRACTOR CERTIFICATION

I hereby certify that I have reviewed the entire submittal, stamped and signed all attachments and have verified field requirements and compliance with the Contract Documents.

CONTRACTOR:
ADDRESS:
SIGNED:
DATE:

SUBCONTRACTOR

NAME:
ADDRESS:

PHONE:
CONTACT:

SUBMITTAL STATUS

Submittal Title:

Re-submittal? No ☐ Yes ☐
of Previous Submittal Number:

DATE RECEIVED BY 19six:

CONSULTANT REVIEW

Date Sent: _____
Date Due: _____
Date Rec'd: _____

☐ Civil
☐ Landscape
☐ Structural
☐ Mechanical
☐ Electrical
☐ Plumbing
☐ Interiors
☐ Other
☐ W+P

DISTRIBUTION DATE:

☐ GENERAL CONTRACTOR
☐ OWNER
☐ CIVIL
☐ LANDSCAPE ARCHITECT
☐ STRUCTURAL ENGINEER
☐ MECHANICAL ENGINEER
☐ PLUMBING ENGINEER
☐ ELECTRICAL ENGINEER
☒ OTHER

SUBMITTAL REVIEW

COMMENTS:

CONSULTANT REVIEW:

19six REVIEW:

SD Shop Drawings
PD Product Data / Material Lists / Schedule
S Samples and Mock-ups
OM O & M Manuals
W Warranty Over One Year Period
EM Extra Material / Spare Parts
T Training
L LEED®
A Coordination with Agencies Having Jurisdiction

Note: This submittal list is provided for the contractor's convenience and may not represent ALL submittals and components required by the contract documents. Contractor is ultimately responsible for identifying and providing ALL required submittals and associated components.

[illegible]

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Submittal List

LEGEND:

- SD Shop Drawings
- PD Product Data / Material Lists / Schedule
- S Samples and Mock-ups
- OM O & M Manuals
- W Warranty Over One Year Period
- EM Extra Material / Spare Parts
- T Training
- L LEED®
- A Coordination with Agencies Having Jurisdiction

Note: This submittal list is provided for the contractor's convenience and may not represent ALL submittals and components required by the contract documents. Contractor is ultimately responsible for identifying and providing ALL required submittals and associated components.

SPEC. SECTION	REQUIRED SUBMITTAL TYPE									
	SD	PD	S	OM	W	EM	T	L	A	

SECTION 01 35 13 – SPECIAL PROJECT PROCEDURES – DSA PROJECTS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. The following additional requirements as herein noted and/or as indicated in drawings apply to this DSA-Reviewed Project.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. Division of the State Architect www.dgs.ca.gov/dsa/home.aspx
 - 1. Interpretations of Regulations
- E. California Public School Construction Process www.schoolconstruction.dgs.ca.gov
- F. Refer to specifications, including, but not limited to Section 01080 – Building Codes, Associations, Standards, Definitions and Miscellaneous Requirements.

1.3 RELATED SECTIONS

- A. Related Sections include but are not limited to the following:
 - 1. Division 1
- B. Related Documents include, but are not limited to the following:
 - 1. DSA-1 form
 - 2. DSA-3 form

1.4 ADDITIONAL REQUIREMENTS

- A. Building Code requirements:
 - 1. The code adopted by the California Division of the State Architect (DSA) at the time of construction shall govern minimum requirements for this Project.
 - 2. A copy of the California Building Standards Administrative Code, Title 24, Part 1 and the California Building Code, Title 24, Part 2 shall be available on the project site.
<http://publiccodes.citation.com/st/ca/st/index.htm>

3. All substitutions/changes affecting DSA regulated items shall be considered as changes to the approved plans and/or specifications. These are to be treated as either addenda or change orders and will require DSA approval prior to fabrication and installation.
 - a. Refer to Section 4-338(c) – Addenda and Change Orders and IR A-6 – Change Order and Field Change Approval Process
 - b. Do not begin any work under an addendum or change order approved by **Owner** until it has been approved by DSA, or preliminary approval has been obtained.
4. The intent of these drawings and specifications is that the work of alteration, rehabilitation and/or reconstruction shall be in accordance with Title 24, California Code of Regulations. Should any existing conditions such as deterioration or non-complying documents establish that the finished work will not comply with title 24, California Code of Regulations, a construction change document, or separate set of plans and specifications and calculations, detailing and/or specifying the required repair work shall be submitted to and approved by DSA prior to proceeding with the repair work.
5. In addition to the duties specified in the Contract Documents, the duties of the **General Contractor** shall be in accordance with the California Building Standards Administrative Code, Title 24, Part 1, Group 1 – Safety of Construction of Public Schools, including, but not limited to the provisions of:
 - a. Section 4-336 – Verified Reports
 - b. Section 4-338 – Addenda and Change Orders
 - c. Section 4-343 – Duties of the Contractor
6. In addition to the duties specified in the Contract Documents, the duties of the **Architect** and the **Architect's** consultants shall be in accordance with the California Building Standards Administrative Code, Title 24, Part 1, Group 1 – Safety of Construction of Public Schools, including, but not limited to the provisions of:
 - a. Section 4-331 – Notice to DSA at start of Construction
 - b. Section 4-333(a) – Observation by Architect or Registered Engineer
 - c. Section 4-336 – Verified Reports
 - d. Section 4-338 – Addenda and Change Orders
 - e. Section 4-341 – Duties of the Architect, Structural Engineer or Professional Engineer
 - f. Section 4-344 – Duties of Mechanical and Electrical Engineers
7. The **Owner** shall comply with the California Building Standards Administrative Code, Title 24, Part 1, Group 1 – Safety of Construction of Public Schools as follows:
 - a. An independent California licensed testing laboratory shall be retained by the **Owner** and testing requirements shall be in accordance with but not limited to the provisions of:
 1. Section 4-335 – Tests
 - b. A full-time California Licensed Project Inspector shall be retained by the **Owner**. The **Inspector** shall be approved by DSA and the **Architect**, and shall observe the construction in accordance with but not limited to the provisions of:
 1. Section 4-333(b) – Observation and Inspection of Construction
 2. Section 4-337 – Semimonthly Reports
 3. Section 4-342 – Duties of the Project Inspector

4. IR A-7 – Project Inspector Certification and Approval
5. IR A-8 – Project Inspector and Assistant Inspector Duties and Performance
8. The DSA may supervise construction, reconstruction, or repair in accordance with:
 - a. Section 4-334 – Supervision by the Division of the State Architect.

B. Special Inspections required

1. Refer to the attached DSA-103 form.
2. Refer to California Building Standards Administrative Code, Title 24, Part 1, Group 1 – Safety of Construction of Public Schools:
 - a. Section 4-333(d) – Special Inspection
3. Refer to applicable Specification Sections.
4. Refer to Structural Drawings.

C. DSA requirements

1. DSA is not subject to arbitration proceedings.
2. Substitutions shall be considered as a change order and be approved by DSA.
3. **General Contractor** shall conform to DSA Interpretive Regulations.
4. Should DSA close the project without certification due to the **General Contractor's** failure to perform, or failure to provide any necessary and/or required documents in a timely manner, **General Contractor** shall pay the fee to re-open the project file with DSA.
5. **General Contractor** shall provide all required documentation for DSA Closeout with Certification to the **Architect of Record** in a timely manner, but not later than 60 days after the Contractor's Certificate of Substantial Completion is issued.
 - a. This includes but is not limited to the following:
 1. All testing and lab reports as noted on the DSA-103 (Statement of Structural Tests and Inspections).
 2. Final Verified Reports from testing labs.
 3. DSA-102 forms (contract information) for all contractors, including Construction Management.
 4. Notice of Completion from **Owner**.
 5. DSA-5 (Project Inspector Qualification Record).
 6. DSA-5A (Assistant Project Inspector Qualification Record).
 7. All Change Orders, signed by all parties.
 8. DSA-6 (Final Verified Report) from each Contractor (AFTER all change orders are approved).
 9. DSA-6A/E (Verified Report) from **Architect, Structural, Mechanical** and **Electrical Engineers**, as necessary.
 10. All information requested by the **Architect** and/or DSA.
 - b. DSA forms listed herein may be obtained on the DSA website:
www.dgs.ca.gov/dsa/Forms.aspx

1.5 DSA PROJECT SUBMITTAL AND PLAN REVIEW

A. Automatic Fire Sprinkler System

- a. Refer to Division of State Architect, DSA - Fire And Life Safety Guideline for:
 1. Project Submittal Guideline, "Automatic Fire Sprinkler Systems"
 - a. See also DSA-1 & DSA-3 forms for additional requirements.
- B. Fire Alarm and Detection Systems
 - a. Refer to Division of State Architect, DSA - Fire And Life Safety Guideline for:
 1. Project Submittal Guideline, "Fire Alarm and Detection Systems"
 - a. See also DSA-1 & DSA-3 forms for additional requirements.
- C. Fire Alarm Control Unit Replacement
 - a. Application:
 1. Scope of work is only the replacement of the Fire Alarm Control Unit in an existing building
 - b. Document:
 1. Refer to State Fire Marshal's:
 - a. "Fire Alarm Control Unit Replacement in Existing Buildings"
- D. Deferred Submittals
 1. Refer to California Building Standards Administrative Code, Title 24, Part 1, Group 1 – Safety of Construction of Public Schools, Section 4-317(g).
 - a. Only where a portion of the construction cannot be adequately detailed on the approved plans because of variations in product design and/or manufacturer, the approval of plans for such portion, **when specifically accepted by DSA**, may be deferred until the material suppliers are selected, provided the following conditions are met:
 1. The Construction Documents clearly indicate that a deferred approval by DSA is required for the indicated portions of the work prior to fabrication and installation.
 2. The Construction Documents adequately describe the performance and loading criteria for such work.
 3. The **Architect** or **Engineer** stamps and signs the plans and specifications for the deferred approval item. The **Architect** or **Engineer** in general responsible charge of the design of the project shall submit the plans and specifications for the deferred approval item to DSA, with notation indicating that the deferred approval documents have been found to be in general conformance with the design of the building.
 4. Fabrication of deferred approval items shall not begin without first obtaining the approval of plans and specifications by DSA.
 2. Refer to Overview of DSA Plan Submittal and Review/Introduction to Project Submittal and Plan Review <http://www.dgs.ca.gov/dgs/tabid/1408/Default.aspx#G>

END OF SECTION 01 35 13

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SECTION 01 41 00 – REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. This section and related attachments are for general use and specific use as herein indicated, as herein specified and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. References to:
 - a. Building Codes and Regulations.
 - 1) All construction shall be in accordance with:
 - a) All applicable codes & all local regulations & local agencies having jurisdiction.
 - b) The Americans with Disabilities Act.
 - c) State and Federal Regulations and Agencies having jurisdiction.
- C. The **General Contractor** shall obtain and maintain at the project site a copy of the referenced codes as deemed necessary to complete the work.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
 - 1. Part 1 – California Administrative Code - (CAC)
 - 2. Part 2 - Volume 1 & 2 - California Building Code – (CBC)
 - 3. Part 3 – California Electrical Code – (CEC)
 - 4. Part 4 – California Mechanical Code – (CMC)
 - 5. Part 5 – California Plumbing Code – (CPC)
 - 6. Part 6 – California Energy Code – (CEC)
 - 7. Part 7 – (No longer published, refer to Title 8)
 - 8. Part 8 – California Historical Building Code
 - 9. Part 9 – California Fire Code (CFC)
 - 10. Part 11 – California Green Building Standards Code
 - 11. Part 12 – California Referenced Standards Code
- B. Current California Code of Regulations (CCR), Office of Administrative Law www.oal.ca.gov/CCR.htm
 - 1. Title 8, CCR, Industrial Regulations, Subchapter 6. Elevator Safety Orders
 - 2. Title 19 CCR, Public Safety
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. NFPA: Including, but not limited to the following; editions as listed, unless jurisdiction recognizes another edition:

1. 2021 NFPA 10 Standard for Portable Fire Extinguishers
2. 2022 NFPA 12 Standard on Carbon Dioxide Extinguishing Systems
3. 2022 NFPA 12A Standard on Halon 1301 Fire Extinguishing Systems
4. 2022 NFPA 13 Installation of Sprinkler Systems
5. 2019 NFPA 14 Installation of Standpipe, Private Hydrant and Hose Systems
6. 2024 NFPA 17 Dry Chemical Extinguishing Systems
7. 2024 NFPA 17A to a UL 300 for Class I Hood Fire Suppression System. (Wet Chemical Extinguishing Systems)
8. 2022 NFPA 20 Installation of Stationary Pumps for Fire Protection
9. 2022 NFPA 24 Installation of Private Fire Service Mains and Their Appurtenances
10. 2023 NFPA 25 Inspection, Testing, Maintenance of Water-Based Fire Protection Systems
11. 2024 NFPA 30 Combustible and Flammable Liquids Code
12. 2024 NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages
13. 2022 NFPA 72 National Fire Alarm Code
14. 2022 NFPA 80 Standard for Fire Doors and Other Opening Protectives
15. 2023 NFPA 85 Boiler and Combustion Systems Hazards Code
16. 2024 NFPA 101 Life Safety Code
17. 2016 NFPA 110 Standard for Emergency and Standby Power Systems
18. 2018 NFPA 2001 Clean Agent Fire Extinguishing Systems

1.3 DATES OF CODES

- A. Except where a specific date of issue is mentioned herein, references to specifications issued by the above named and other organizations shall mean the edition current on the date of the issuance of project permit.

1.4 MISCELLANEOUS REQUIREMENTS

- A. OSHA Requirements
 1. **General Contractor** must comply with all standards and requirements of the occupational safety and health administration.
 - a. Notify **Owner** immediately of items not complying.

PART 2 - **PRODUCTS**

Not used

PART 3 - **EXECUTION**

Not used

END OF SECTION 01 41 00

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SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. This section and related attachments are for general use and specific use as herein indicated as herein specified and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. References to:
 - a. Standards
 - b. Associations
 - c. Definitions
 - d. Abbreviations
 - e. Miscellaneous items are intended to provide a central location for reference.
 - 1) This section shall provide assistance with definitions.
- C. The **General Contractor** shall obtain and maintain at the project site a copy of the referenced standards as deemed necessary to complete the work.

1.2 REFERENCE STANDARDS

- A. Refer to Section 01 41 00 – Regulatory Requirements

1.3 ASSOCIATIONS

- A. Associations shall include, but not be limited to:
 - 1. AA Aluminum Association www.aluminum.org
 - 2. AABC Associated Air Balance Council
 - 3. AAC Aluminum Anodizers Council
 - 4. AAMA American Architectural Manufacturers Association www.aamanet.org
 - 5. AAN American Association of Nurserymen
 - 6. AASHTO American Association of State Highway and Transportation Officials
www.transportation.org
 - 7. AATCC American Association of Textile Chemists and Colorists
 - 8. AAU Amateur Athletic Union
 - 9. ABMA American Boiler Manufacturers Association www.abma.com
 - 10. ACIL American Council of Independent Laboratories
 - 11. ACPA American Concrete Pipe Association
 - 12. ADA/ ADAAG Americans with Disabilities www.usdoj.gov/crt/ada/adahom1.htm
Act Accessibility Guidelines www.access-board.gov
 - 13. ADC Air Diffusion Council
 - 14. AFPA American Forest and Paper Association
 - 15. AGA American Gas Association www.aga.org

16. AGC Associated General Contractors of America www.agc.org
17. AGMA American Gear Manufacturers Association www.agma.org
18. AHA American Hardboard Association
19. ACI American Concrete Institute www.aci-int.org
20. AHAM Association of Home Appliance Manufacturers
21. AI Asphalt Institute
22. AIA American Institute of Architects www.aia.org
23. AIHA American Industrial Hygiene Association
24. AIMA Acoustical and Insulating Materials Association
25. AISC American Institute of Steel Construction www.aisc.org
26. AISI American Iron and Steel Institute www.steel.org
27. AITC American Institute of Timber Construction
28. ALI Associated Laboratories, Inc.
29. ALSC American Lumber Standards Committee
30. AMCA Air Movement and Control Association
31. ANSI American National Standards Institute www.ansi.org
32. AOSA Association of Official Seed Analysts
33. APA American Plywood Association www.apawood.org
34. API American Petroleum Institute www.api.org
35. APWA American Public Works Association www.apwa.net
36. ARI Air-Conditioning and Refrigeration Institute
37. ARMA Asphalt Roofing Manufacturers Association
38. ASA Acoustical Society of America www.asa.aip.org
39. ASC Adhesive and Sealant Council
40. ASCE American Society of Civil Engineers www.asce.org
41. ASHRAE American Society of Heating, Refrigerating, and Air-Conditioning Engineers
www.ashrae.org
42. ASME American Society of Mechanical Engineers(ASME), www.asme.org
43. ASPA American Sod Producers Association (ASPA)
44. ASPE American Society of Plumbing Engineers (ASPE), www.aspe.org
45. ASSE American Society of Sanitary Engineering (ASSE),
www.asse-plumbing.org
46. ASTM American Society For Testing & Materials www.astm.org
47. ATIS Alliance for Telecommunications Industry Solutions
48. AWG American Wire Gage
49. AWI Architectural Woodwork Institute www.awinet.org
50. AWPB American Wood Preservers Bureau www.awpa.com
51. AWS American Welding Society www.aws.org
52. AWWA American Water-Works Association www.awwa.org
53. AWWPA American Wood Protection Association
54. AWPI American Wood Preservers Institute www.awpai.com
55. BHMA Builder's Hardware Manufacturers Association www.buildershardware.com
56. BIA Brick Industry Association
57. BIFMA The Business and Institutional Furniture Manufacturer's Association
58. BSI Building Stone Institute
59. CAGI Compressed Air and Gas Institute

- 60. CALTrans State of California, Department of Transportation
- 61. CAUS Color Association of the United States
- 62. CBHF Bureau of Home Furnishings and Thermal Insulation, State of California, Dept. of Consumer Affairs
- 63. CBSC California Building Standards Commission (California Code of Regulations, Title 24) www.bsc.ca.gov
- 64. CBM Certified Ballast Manufactures
- 65. CCC Carpet Cushion Council
- 66. CCMTC California Concrete Masonry Technical Committee
- 67. CDA Copper Development Association
- 68. CFFA Chemical Fabrics and Film Association, Inc.
- 69. CGA Compressed Gas Association
- 70. CISCA Ceilings & Interior Systems Construction Association www.cisca.org
- 71. CISPI Cast Iron Soil Pipe Institute
- 72. CLFMI Chain Link Fence Manufacturing Institute
- 73. CPSC Consumer Product Safety Commission
- 74. CRA California Redwood Association www.calredwood.org
- 75. CRI Carpet and Rug Institute
- 76. CRSI Concrete Reinforcing Steel Institute www.crsi.org
- 77. CS Commercial Standard
- 78. CSA Canadian Standards Association
- 79. CSI Construction Specifications Institute www.csinet.org
- 80. CSSB Cedar Shingle and Shake Bureau
- 81. CTI Ceramic Tile Institute www.ctioa.org
- 82. DFPA Douglas Fir Plywood Association now known as American Plywood Association www.apawood.org
- 83. DHI Door Hardware Institute
- 84. DIPRA Ductile Iron Pipe Research Association
- 85. DLPA Decorative Laminate Products Association
- 86. DSA Division of the State Architect www.dsa.ca.gov
- 87. EIA Electronic Industries Association
- 88. EIMAEIFS Industry Manufacturers Association
- 89. EJMA Expansion Joint Manufacturers Association
- 90. ETL Electrical Testing Laboratory
- 91. FCI Fluid Controls Institute
- 92. FCICA Floor Covering Installation Contractors Association
- 93. FGMA Flat Glass Marketing Association
- 94. FM Factory Mutual Research Corporation www.fmglobal.com
- 95. FS Federal Specifications www.fss.gsa.gov/pub/fedspecs/search.cfm
- 96. FSC Forest Stewardship Council
- 97. FTI Facing Tile Institute
- 98. GA Gypsum Association
- 99. GANA Glass Association of North America
- 100. GIS Germany Institute for Standardization
- 101. HEI Heat Exchange Institute
- 102. HI Hydronics Institute

- 103. HMA Hardwood Manufacturers Association
- 104. HMMA Hollow Metal Manufacturers Association (Division of NAAMM)
www.naamm.org/hmma
- 105. HPVA Hardwood Plywood and Veneer Association
- 106. HUD U.S. Dept of Housing and Urban Development
- 107. IAPMO International Association of Plumbing and Mechanical Officials
- 108. IBD Institute of Business Designers
- 109. ICC International Code Council www.iccsafe.org
- 110. ICC-ES International Code Council Evaluation Service
- 111. ICEA Insulated Cable Engineers Association
- 112. ICBO International Conference of Building Officials www.iccsafe.org
- 113. ICRI International Concrete Repair Institute www.icri.org
- 114. IEC International Electro-technical Commission
- 115. IEEE Institute of Electrical and Electronics Engineers www.ieee.org
- 116. IESNA Illuminating Engineering Society of North America www.iesna.org
- 117. IFAI Industrial Fabrics Association International
- 118. IGCC Insulating Glass Certification Council
- 119. ILI Indiana Limestone Institute of America
- 120. IMIAC International Masonry Industry All-Weather Council
- 121. IMSA International Municipal Signal Association
- 122. IPCEA Insulated Power Cable Engineers Association www.icea.net
- 123. IPEMA International Play Equipment Manufacturers Association
- 124. IRI Industrial Risk Insurers
- 125. ISA Instrument Society for Measurement and Control
- 126. ISO International Standards Organization
- 127. JICS Joint Industry Conference Standards
- 128. KCMA Kitchen Cabinet Manufacturers Association
- 129. LEED Leadership in Energy and Environmental Design www.usgbc.org/LEED
- 130. LIA Lead Industries Association, Inc.
- 131. LPI Lightning Protection Institute
- 132. LSGA Laminators Safety Glass Association
- 133. MBMA Metal Building Manufacturers Association www.mbma.com
- 134. MCAA Mechanical Contractors Association of America
- 135. MFMA Maple Flooring Manufacturers Association
- 136. MIA Marble Institute of America
- 137. ML/SFA Metal Lath/Steel Framing Association (Division of NAAMM)
- 138. MMSA Materials and Methods Standards Association
- 139. MSS Manufacturer's Standardization Society of the Valve and Fitting Industry
www.mss-hq.org
- 140. NAA National Arborist Association
- 141. NAAMM National Association of Architectural Metal Manufacturers www.naamm.org
- 142. NAIMA North American Insulation Manufacturers Association
- 143. NAPA National Asphalt Pavement Association
- 144. NBFU National Board of Fire Underwriters (American Insurance Assn.)
www.nbfu.com
- 145. NCAA National Collegiate Athletic Association

146. NCCA National Coil Coaters Association www.coilcoating.org
147. NCMA National Concrete Masonry Association
148. NCPI National Clay Pipe Institute
149. NCRPM National Council on Radiation Protection and Measurements
150. NCSBCS National Conference of States on Building Codes and Standards
www.NCSBCS.org
151. NCSPA National Corrugated Steel Pipe Association
152. NECA National Electrical Contractors Association
153. NEI National Elevator Industry, Inc. www.neii.org
154. NEMA National Electrical Manufacturers Association www.nema.org
155. NES National Evaluation Service www.icc-es.org
156. NETA International Electrical Testing Association
157. NFPA National Fire Protection Agency www.nfpa.org
158. NHLA National Hardwood Lumber Association
159. NISD National Institute of Steel Detailing www.nisd.org
160. NIST National Institute of Standards and Technology
161. NLGA National Lumber Grades Authority
162. NOFMA National Oak Flooring Manufacturers Association
163. NOMMA National Ornamental and Miscellaneous Metals Association
164. NPA National Particleboard Association
165. NPCA National Paint and Coatings Association
166. NRB National Research Board, Council Of American Building Officials
167. NRCA National Roofing contractors Association
168. NRMCA National Ready-Mix Concrete Association
169. NSF National Sanitation Foundation www.nsf.org
170. NSSEA National School Supply and Equipment Association
171. NSWMA National Sanitation and Waste Management Association
172. NTMA National Terrazzo and Mosaic Association
173. NWWDA National Wood Window and Door Association
174. OSHA Occupational Safety and Health Administration www.osha.gov
175. OSHPD Office of Statewide Health Planning and Development
176. PATMI Power Actuated Tool Manufacturer's Institute, Inc.
177. PCA Portland Cement Association www.cement.org
178. PCI Pre-stressed Concrete Institute www.pci.org
179. PDCA Painting and Decorating Contractors of America
180. PDI Plumbing and Drainage Institute
181. PEI Porcelain Enamel Institute
182. PS Product Standard of National Bureau of Standards
183. RFCI Resilient Floor Covering Institute
184. RIS Redwood Inspection Service
185. RMA Rubber Manufacturers Association
186. SAMA Scientific Apparatus Makers Association
187. SDI Steel Deck Institute
188. SIGMA Sealed Insulating Glass Manufacturers Association
189. SFM State Fire Marshal
190. SGCC Safety Glazing Certification Council

191.	SJI	Steel Joist Institute
192.	SMA	Screen Manufacturers Association
193.	SMA	Stucco Manufacturers Association
194.	SMACNA	Sheet Metal and Air Conditioning Contractors, Association www.smacna.org
195.	SPIB	Southern Pine Inspection Bureau
196.	SPR	Simplified Practice Recommendation
197.	SPRI	Single-Ply Roofing Institute
198.	SSMA	Steel Stud Manufacturers Association www.ssma.com
199.	SSPC	Steel Structures Painting Council www.sspc.org
200.	SSPMA	Sump and Sewage Pump Manufacturers Association
201.	STI	Steel Tank Institute
202.	SWI	Steel Window Institute
203.	SWPA	Submersible Wastewater Pump Association
204.	SWRI	Sealant, Waterproofing and Restoration Institute www.swrionline.org
205.	SWRCB	California Environmental Protection Agency, State Water Resources Control Board Water Quality (Stormwater Prevention Plan)
206.	TCNA	The Tile Council of North America, Inc. www.tileusa.com
207.	TIMA	Thermal Insulation Manufacturers Association
208.	TPI	Truss Plate Institute
209.	UL	Underwriters Laboratories, Inc. www.ul.com
210.	UNI	Uni-Bel PVC Pipe Association
211.	USGBC	United States Green Build Council
212.	USP	United States Pharmacopoeial Convention
213.	USPHS	United States Public Health Service www.usphs.gov
214.	USDA	United States Department of Agriculture
215.	USTC & TBA	United States Tennis Court and Track Builders Association
216.	VWDI	Vinyl Window and Door Institute
217.	WA	Wall Coverings Associations
218.	WCLIB	West Coast Lumber Inspection Bureau www.wclib.com
219.	WCMA	Window Covering Manufacturers Association
220.	WCRSI	Western Concrete Reinforcing Steel Institute
221.	WH	Warnock Hersey International, Inc.
222.	WI	Woodwork Institute
223.	WLPDIA	Western Lath, Plaster, Drywall Industries Association
224.	WPS	Welding Procedures Specifications
225.	WRI	Wire Reinforcement Institute
226.	WSC	Water Systems Council
227.	WSFI	Wood and Synthetic Flooring Institute
228.	WWPA	Western Woods Product Association www.wwpa.org
229.	W.I.	Woodwork Institute Manual of Millwork www.woodworkinstitute.com

1.4 DATES OF STANDARDS

- A. Except where a specific date of issue is mentioned herein, references to specifications issued by the above named and other organizations shall mean the edition current on the date of the issuance of project permit.

1.5 DEFINITIONS

A. The following are used in specifications and documents in addition to Division 1 as herein defined:

1. Accepted Equal or Accepted Equivalent:
 - a. Reviewed and accepted by the **Architect** as being equal in quality, utility and appearance and within the Design Intent of the documents, but shall not in any way change or delete the original intent of the documents.
2. Approved:
 - a. As accepted by the **Architect** (shop drawings & Submittals shall be reviewed for design intent but shall not be approved.
 1. Does not include review for items changed but not specifically noted by **Contractor**.
3. Approved Equal / Approved Equivalent:
 - a. As accepted by the **Architect** (shop drawings & Submittals shall be reviewed for design intent but shall not be approved.
 1. Does not include review for items changed but not specifically noted by **Contractor**.
4. As Required:
 - a. As required by referenced standards, existing project conditions, Contract Documents or regulatory requirements.
5. Directed:
 - a. As instructed by the **Architect** and/or **Owner** in writing.
6. Documents:
 - a. Includes:
 1. Drawings
 2. Project Manual/Specifications
 3. Owner/Contractor Contract
 4. Addendums
 5. Supplemental Documents in accordance with project manual / specifications.
7. Drawings:
 - a. Drawn representation of the scope of work.
8. Furnish (materials):
 - a. To supply and deliver to the project site in new condition ready for installation and in operable and new condition.
9. Geotechnical Engineer
 - a. A **Civil** or **Geotechnical Engineer** licensed in the State of California, who is retained and paid by the **Owner** to perform services as specified in the Contract Documents.
10. Indicated:

- a. As shown, noted on the drawings and/or specifications or scheduled in the drawings.
- 11. Install (service or labor):
 - a. Anchor, fabricate, connect and/or fasten in place and adjust for use and/or place or apply in proper position & location and/or establish in place for use or service.
 - b. To place in final position, complete, anchored, connected, and in operable condition with respect to required codes and/or governing agency requirements.
- 12. Project Manual:
 - a. Is the volume which includes the; Bidding Requirements, Contract Forms, Conditions of the Contract and the Specifications.
- 13. Provide:
 - a. To furnish, install and fabricate complete.
- 14. Shall:
 - a. To be construed as 'mandatory'.
- 15. Site:
 - a. Area to be occupied by the Project.
 - b. Any portion directly outside exterior face of exterior walls.
- 16. Similar:
 - a. Shall be interpreted in its general sense and not as necessarily meaning identical, and all details shall be worked out in relationship to their location and to their connection with other parts of the work.
- 17. Owner:
 - a. The Owner of the project, or their authorized agent / on-site representative.
- 18. Testing Agency:
 - a. An organization other than the Testing Laboratory retained and paid by the **Contractor** to perform tests and reports on whether or not designated items of Work comply with the requirements of the Contract Documents.
- 19. Testing Laboratory:
 - a. An independent commercial testing organization, retained and paid by the **Owner** to perform tests and report on Work as specified in the Contract Documents, and as otherwise required.
 - 1. **General Contractor** shall pay for Testing when they have not provided the appropriate time prior to testing being required to be done.

1.6 ABBREVIATIONS

- A. The following is a reference list including basic abbreviations included in Project manual and/or drawings including, but not limited to;
 - 1. Refer also to drawings and individual specifications for additional abbreviations.

&	and
L	Angle
@	at
CL	Centerline
Ø	Diameter
#	Number
(E)	Existing
(F)	Future
(N)	New
ACOUST	Acoustical
ACP	Asphalt Concrete Paving
ADA	Americans with Disabilities Act
ADDL	Additional
ADO	Automatic Door Opener
ADJ	Adjustable
A.F.F.	Above Finish Floor
A.F.G.	Above Finish Grade
AGGR	Aggregate
ALUM	Aluminum
APPROX	Approximate
ARCH	Architectural
ASSY	Assembly
AV	Audio Visual
BD	Board
BITUM	Bituminous
BKG	Backing
BLDG	Building
BLKG	Blocking
BM	Beam
BMP	Best Management Practices
B.O.	Bottom of / Back of
BR	Backer Rod
BTWN	Between
CAB	Cabinet
CASAM	Cold Applied Self Adhering Waterproof Membrane
CBC	California Building Code
CFCI	Contractor Furnished Contractor Installed
CFOI	Contractor Furnished Owner Installed
CJ	Control Joint
CLG	Ceiling
CLR	Clear

CMU	Concrete Masonry Unit
CNTR	Counter
C.O.	Cased Opening
COL	Column
CONC	Concrete
CONT	Continuous
CORR	Corridor
CR	Card Reader
CTR	Center
CTSK	Countersunk
CUST	Custodial
CW	Cold Water
DBL	Double
DEG	Degree
DEPT	Department
DF	Drinking Fountain
DIA	Diameter
DIM	Dimension
DISP	Dispenser
DN	Down
D.O.	Door Opening
DR	Door
DS	Downspout
DTL	Detail
DWG	Drawing
E	East
EA	Each
EJ	Expansion Joint
EL	Elevation
ELEC	Electrical
ELEV	Elevator
EMER	Emergency
ENCL	Enclosure
EQ	Equal
EQUIP	Equipment
ETC	Et Cetera
EW	Each Way
EXP	Expansion
EXT	Exterior
FA	Fire Alarm
FD	Floor Drain

FND	Foundation
FE	Fire Extinguisher and Bracket Mount with Signage
FEF	Fire Extinguisher and Fully Recessed Cabinet with Signage
FES	Fire Extinguisher and Semi- Recessed Cabinet with Signage
F.F.	Finish Floor
FIN	Finish
FHC	Fire Hose Cabinet
FLG	Flooring
FLR	Floor
FM	Floor Mounted
F.O.	Face of
FRP	Fiber Reinforced Plastic
FT	Foot or Feet
FTG	Footing
FURR	Furring
FURN	Furniture
GA	Gauge
GALV	Galvanized
GC	General Contractor
GD	Garbage Disposal
GLB	Glue Laminated Beam
GR	Grade
GSM	Galvanized Sheet Metal
GYP	Gypsum
HB	Hose Bibb
HC	Hollow Core
HDWR	Hardware
HT	Height
HM	Hollow Metal
HOR	Horizontal
HVAC	Heating, Ventilating, and Air Conditioning
I.D.	Inside Diameter
i.e.	Example
INSUL	Insulation
INT	Interior
IOR	Inspector of Record
IT	Information Technology
JT	Joint

KIT	Kitchen
LAB	Laboratory
LAM	Laminate
LAV	Lavatory
LT	Light / Lighting
LTWT	Lightweight
LVL	Laminated Veneer Lumber
MATL	Material
MAX	Maximum
MECH	Mechanical
MFGR	Manufacturer
MIN	Minimum
MISC	Miscellaneous
M.O.	Masonry Opening
MTD	Mounted
MTL	Metal
N	North
N/A	Not Applicable
NIC	Not in Contract
NOM	Nominal
NTS	Not To Scale
O/	Over
O.C.	On Center
O.D.	Outside Diameter
OF	Overflow
OFCI	Owner Furnished Contractor Installed
OFOI	Owner Furnished Owner Installed
OPNG	Opening
OPP	Opposite
PLAM	Plastic Laminate
PL	Plate
PLYWD	Plywood
PR	Pair
PROP	Property
PSF	Pounds per Square Foot
PSI	Pounds per Square Inch
PSL	Parallel Strand Lumber
PT	Pressure Treated

PV	Photovoltaic
RAD	Radius
RD	Roof Drain
REF	Reference
REFR	Refrigerator
REINF	Reinforcement/Reinforcing
REQD	Required
RM	Room
R.O.	Rough Opening
RWL	Rain Water Leader
S	South
SAABM	Spray Applied Air Barrier Membrane
SCHED	Schedule
SF	Square Foot/Feet
SHTG	Sheathing
SHWR	Shower
SIM	Similar
SMS	Sheet Metal Screws
SPEC	Specification
SS	Stainless Steel
STD	Standard
STL	Steel
STOR	Storage
STRL	Structural
T	Tread
TBD	To Be Determined
TEL	Telephone
TEMP	Temporary
T&G	Tongue and Groove
T.O.	Top of
TS	Tube Steel
TV	Television
TYP	Typical
UC	Under Counter
UL	Underwriters Laboratory
UON	Unless Otherwise Noted
VERT	Vertical
VEST	Vestibule
VIF	Verify in Field

W	West
W/	With
WC	Water Closet
WDW	Window
WH	Water Heater
W.O.	Where Occurs
W/O	With Out
WRB	Water Resistant Barrier
WT	Weight

1.7 MISCELLANEOUS REQUIREMENTS

A. Prior Use or Occupancy

1. Refer to Division 1 for closeout submittal procedures.

B. Lines & Levels

1. Before starting work, locate all general reference points.
 - a. Take such steps as are necessary to prevent their dislocations or destruction.
 - b. If disturbed or destroyed, replace as directed.
 - c. Employ competent surveyor to lay out work; be responsible for its accuracy.

C. As-Built – Record Drawings

1. Scope of contractors responsibilities, refer to, but not limited to:
 - a. Individual specification sections.
 - b. Division 1 – General Requirements
 - c. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - d. Refer to Division 1 for closeout submittal procedures.

D. Workmanship

1. Refer to individual specification sections
2. Refer to Division 1 general requirements
3. Refer to Division 1 for quality control requirements.
4. All work involved in this project shall reflect the best possible workmanship.
 - a. Any work which is not of the best workmanship shall be corrected or redone as is required for approval by the **Architect**, at no additional cost to the **Owner**.
5. No trade should apply any finishes or materials to any surfaces until they feel that the surfaces are ready to receive the finish or material and produce the best possible workmanship.
 - a. Any trade who does apply the finish or materials to surfaces that are not ready shall remove and correct their work as well as prepare the existing surfaces involved at no additional cost to the **Owner**.

E. Vendor and Sub-Contractors

1. **General Contractor** shall provide **Architect** with a complete list of subcontractors and principal vendors including addresses and telephone numbers. List each under heading of subcontractor category and/or vendor type.
 2. The **General Contractor** is responsible for determination and coordination of union and/or non-union project affiliation.
 - a. **General Contractor** shall prepare and adhere to the Contract Construction Schedule based on required Contract time of completion. In the event of termination by parties hereto, all work performed and materials furnished shall be fairly allocated and apportioned in accordance with good construction practices.
- F. Termination by **Owner**
1. Refer to but not limited to; General Conditions.
- G. Warranties:
1. Refer to individual specification sections.
 2. Refer to Division 1 for closeout submittal procedures.
- H. Maintenance Manuals:
1. Refer to individual specification sections.
 2. Refer to Division 1 for closeout submittal procedures.
- I. Other items not herein listed;
1. Refer to but not limited to:
 - a. Refer to Division 1 for closeout submittal procedures.

PART 2 - **PRODUCTS**

Not used

PART 3 - **EXECUTION**

Not used

END OF SECTION 01 42 00

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SECTION 01 45 00 – QUALITY CONTROL

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with all trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Control quality of installation of materials & systems.
 - 2. Control quality of construction.
 - 3. Control quality of site demolition.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. Title 24, California Code of Regulations, California Building Standards Commission.
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. California Energy Code, California Code of Regulations, Title 24, Part 6, California Building Standards Commission.
- E. Title 24, Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction:
 - a. All occupancy types.

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:
 - 1. Comply with manufacturer's standards.
 - 2. Comply with Building Code.
 - 3. Job site inspections shall be done as herein specified and as listed in drawings.
 - 4. Testing shall be done as herein specified and as listed in drawings.
 - 5. Comply with requirements of specific Specification Section and/or Drawings.

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - 1. Coordinate with each specific Specification Section.

- B. Refer to Division 1 for sustainability requirements.
- C. Mock-ups:
 - 1. Shall be reviewed and approved in field by **Architect**.

1.5 QUALITY ASSURANCE

- A. Refer as herein indicated and as indicated in each specific Specification Section.
- B. Hazardous materials:
 - 1. It is illegal to manufacture, sell or use products containing asbestos in the United States.
 - a. These specifications rely on the product manufacturers and distributors to insure that the products they manufacture and/or distribute comply with all statutes and regulations governing their products.
 - b. It is understood that there has not been any testing or inspection done to confirm any hazardous materials of the specified products to confirm compliance with these statutes and regulations by the **Architect**.
 - c. Therefore, these specifications are done not knowingly including any specified products or materials which contain asbestos and/or any other hazardous material.
 - d. Any materials suspected of containing hazardous materials shall be brought to the attention of **Owner**.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Refer as indicated in each specific Specification Section.
- B. Field-verify that all components, substrates, backing, mock-ups, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times during testing.

1.9 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Project construction.
 - 2. Project site demolition.
 - 3. Testing & inspection by others.
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1.
 - 2. All Drawings and Specification Sections.

1.10 SEQUENCING AND SCHEDULING

- A. **General Contractor** shall schedule all testing & inspections and coordinate attendance by **Architect, Owner,** and others.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. **General Contractor** shall coordinate slab vapor emission and PH testing of concrete floors and ensure that concrete treatment within criteria of finish flooring is complete prior to the installation of finish flooring as herein specified; refer to Section 07 28 00 – Concrete Slab Vapor Emission and Alkalinity Control Treatment.

1.11 TESTING AND INSPECTIONS

- A. Testing required by Testing Agent / Testing Agency shall be done in accordance with Division 1 Testing Laboratory service requirements and as indicated in the Contract Documents.
- B. Testing required by **General Contractor** shall be done in accordance with this Section and each specific Specification Section requiring field testing and/or inspection.
- C. Geotechnical Engineer:
 - 1. Services of a **Geotechnical Engineer** are required for Work specified in various individual Specification Sections and/or as indicated in drawings and Division 1 Testing Laboratory service requirements.

1.12 GENERAL SYSTEM DESCRIPTION

- A. Observation and Supervision:
 - 1. The **Architect** and **Owner** or their appointed representatives will review the Work for design intent at appropriate stages, and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review.
 - a. **Owner:**
 - 1) The **Owner** shall have access to the Work wherever it is in preparation or progress for ascertaining that work is in accordance with the Contract Documents. The **General Contractor** shall provide facilities, hard hats, and access and shall provide assistance for sampling or measuring materials.
 - 2) The **Owner** will notify the **Architect** and **Engineers of Record**, and call to the **General Contractor's** attention all observed failure of work and/or material not conforming to Contract Documents.
 - b. **General Contractor:**
 - 1) Shall comply with all requirements of the Contract Documents (Drawings, Specifications, **Owner's** General Conditions and Owner-General Contractor Contract). He shall supervise and direct the Work and maintain a competent superintendent on the job who is authorized to act in all matters pertaining to the Work. The **General Contractor's** superintendent shall also inspect all materials as they arrive for compliance with the Contract Documents. He shall reject defective work or materials immediately upon performance or delivery.
- B. Geotechnical Engineer services:

1. Refer to Division 1 for Testing Laboratory service requirements.
- C. Testing Laboratory services:
 1. Refer to Division 1 for Testing Laboratory service requirements.
- D. Field testing not done under Division 1:
 1. By **General Contractor** as required per Drawings and or Specifications.
- E. Inspections:
 1. Done by product and/or system manufacturer's approved representative for products/systems requiring Inspections.
- F. Observations:
 1. Done by product and/or system manufacturer's approved representative for products/systems requiring observations for general compliance.
- G. Mock-ups:
 1. Reviewed for acceptance by **Architect** and **Owner** as indicated in specific Specification Sections.
- H. Mock-ups
 1. Reviewed for acceptance by **Architect** and **Owner** as indicated in specific Specification Sections.

1.13 MAINTENANCE

- A. Refer to each specific Specification Section for which products and/or assemblies will require follow-up maintenance and/or adjustment after project is complete and has been occupied for a given period of time.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 INSPECTION/EXAMINATION

- A. Verification of Conditions:
 1. Examine areas and conditions under which work is to be performed.
 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.

- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 TESTING, INSPECTIONS AND OBSERVATIONS

A. General

1. Product manufacturer inspections and observations shall be done by authorized representative & observed by **General Contractor**.
 2. The **General Contractor** shall be responsible for scheduling all required tests and inspections.
 - a. Notify the **Owner** and **Architect** 48 hours in advance of scheduled performance of any work requiring testing or inspection.
 3. The **General Contractor** shall provide access to Work to be tested, facilitate inspections, observations, tests and furnish incidental labor and facilities.
 4. The **General Contractor** shall orchestrate inspections of work performed, and construction of mock-ups with **Architect** and **Owner**.
 5. Re-Inspection & Testing
 - a. The **General Contractor** shall pay for:
 - 1) Tests of materials, inspections, and certifications required by Specifications.
 - 2) Testing, adjusting, and balancing of equipment and systems required by Specifications.
 - 3) Re-tests or re-inspections, if required, and tests or inspections required to established Contractor error or missing test data required by Specifications.
 - 4) Uncovering of work in accordance with Division 1 cutting and patching requirements.
 - 5) Additional tests directed by the **Architect** or **Owner** which establish that materials and installation do not comply with the Contract Document.
 6. Testing & Inspection Reports and Certifications
 - a. A copy of each **General Contractor** provided testing, inspection, observation report or certification shall be provided to each of the following:
 - 1) **Owner**
 - 2) **Architect**
 - 3) **General Contractor**
- B. **General Contractor** testing shall be done in accordance with individual Specification Sections and manufacturer's requirements.

3.4 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. **General Contractor** shall keep the work areas in a clean and safe condition so their testing and inspection services do not interfere with the work of others.
- C. **General Contractor** shall protect work and materials of others testing and protect the installed work and materials of other trades.
- D. Perform testing in accordance with listed requirements, industry standards and also as indicated in drawings and other specification sections.

- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.

END OF SECTION 01 45 00

SECTION 01 45 29 – TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION:

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with **General Contractor**.
- C. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Field inspections.
 - 2. Field testing.
 - 3. Laboratory testing.
- D. **Owner** will employ and pay for services of an independent testing laboratory to perform specified testing unless otherwise specified to be performed and/or paid for by others.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction:
 - a. All occupancy types.
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society For Testing and Materials (ASTM), www.astm.org
 - 1. ASTM – E329 Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as used in Construction.

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:
 - 1. Comply with Building Code.
 - 2. Job site inspections shall be done as herein specified.
 - 3. Testing shall be done as herein specified.
 - 4. Comply with requirements of specific Specification Section and/or Drawings.

1.4 SUBMITTALS

- A. Testing Agent / Agency shall submit schedule list of all testing to **Owner, Architect and General Contractor**.

1.5 QUALITY ASSURANCE

- A. Refer to Section 01 45 00 - Quality Control.
- B. Testing Agent/Agency shall have been in business for **five (5)** years providing inspection services for projects of similar size and complexity.
- C. Laboratory is not authorized to release, revoke, alter or enlarge on requirements of Contract Documents, or to perform any duties of **General Contractor** and/or Subcontractors.

1.6 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.

1.7 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Construction by others.
 - 2. Site demolition by others.
 - 3. Testing by **General Contractor**.
 - 4. Inspections by product/system manufacturers.
- B. Related Sections include, but are not limited to the following:
 - 1. Section 01 45 00 – Quality Control
 - 2. Section 01 74 19 – Construction Waste Management and Disposal/Recycling
 - 3. Section 01 81 13 – Project Sustainability Requirements
- C. Related Documents include, but are not limited to the following:
 - 1. Section 00 72 00 – General Conditions

1.8 SEQUENCING AND SCHEDULING

- A. Schedule testing with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. **General Contractor's** Responsibilities
 - 1. Refer to Section 01 45 00 Quality Control.

1.9 TESTING AGENT

- A. Company: TBD
 - 1. Address: TBD
 - 2. Address: TBD
 - 3. Website: TBD
 - 4. Phone number: TBD
- B. The **Owner** reserves the right to change testing laboratories if the need arises.

1.10 GENERAL SYSTEM DESCRIPTION

- A. Testing and inspection performed by Testing Agent/Agency shall include, but not be limited to:
 - 1. Refer to drawings and specifications.
 - 2. Refer to Agency approved Special Testing and Inspections form.

3. Refer to Geotechnical Report
4. Roofing; refer to specification Section 07 54 23.

PART 2 - **PRODUCTS:**

Not Used

PART 3 - **EXECUTION**

3.1 INSPECTION/EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which testing and inspection is to be performed.
2. Identify conditions detrimental to proper or timely completion of testing and/or inspection and coordinate with **General Contractor** to rectify.

3.2 COORDINATION

A. Refer to Section 01 31 13 – Project Coordination.

- #### B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades is ready for testing and/or inspection.

3.3 TESTING

A. General

1. Testing required by **General Contractor** shall be done in accordance with Section 01 45 00 - Quality Control and specific sections requiring field testing and/or inspection.
2. Testing Agent/Agency tests shall be in conformance with requirements of the Contract Documents.
 - a. Refer to project Structural Tests as indicated in Contract Documents and approved Agency Special Inspections and Testing form.
3. Testing and inspection in connection with earthwork shall be under the direction of the **Owner's** consulting Geotechnical Engineer, referred to hereinafter as the "Geotechnical Engineer".
4. Testing and inspection of construction materials and workmanship shall be done by a qualified laboratory, referred to hereinafter as the "Testing Laboratory".
 - a. The Testing Laboratory shall be under direction of a Civil Engineer registered in the State of California to oversee the work / items being tested and shall conform to, but not be limited to the requirements of ASTM E329, and shall be employed by the **Owner**.

B. Laboratory Duties:

1. General: Comply with ASTM E329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction". Cooperate with **Architect**, **Engineer** and **Contractor**; provide qualified personnel after due notice. Perform specified inspections, sampling and testing of materials and methods of construction. Verify compliance with specified standards. Ascertain compliance of specified materials with

requirements of Contract Documents. Promptly inform **Architect** and **Engineer** of observed irregularities or deficiencies of work or products.

2. Reports and Additional Testing:

- a. Submit one (1) pdf copies of each report each to the **Owner**, **Architect** and **General Contractor**.

C. Testing Laboratory:

1. Services of a **Testing Agent / Agency** are required for Work specified in various individual Specification sections and/or as indicated in drawings.
2. **General Contractor's** Responsibilities:
 - a. Cooperate with Testing Laboratory personnel.
 - b. Furnish copies of product test reports as specified.
 - c. Furnish incidental labor and facilities:
 - 1) To provide access to Work to be tested.
 - 2) To obtain and handle samples at the Project site or at the source of the product to be tested.
 - 3) To facilitate inspections and tests.
 - 4) For storage and curing of test samples.
 - d. Notify the **Owner's** Representative sufficiently in advance of operations to allow 48 hours minimum for Testing Laboratory assignment of personnel and scheduling of tests.
 - e. If tests or inspections cannot be performed after such notice, reimburse the **Owner** for the Testing Laboratory personnel and travel expenses incurred.

D. Geotechnical Engineer:

1. Services of a Geotechnical Engineer are required for Work specified in various individual specification sections and/or as indicated in drawings.

3.4 PROTECTION AND CLEAN UP

- A. Refer to Section 01 74 00 – Protection and Cleaning.
- B. Testing agent/Agency shall keep the work areas in a clean and safe condition, so their testing and inspection services do not interfere with the work of others.
- C. Testing agent/Agency shall protect work and materials of others testing and protect the installed work and materials of other trades.
- D. Perform testing in accordance with listed requirements, industry standards and also as indicated in drawings and other specification sections.
- E. In the event of damage, immediately notify the **Owner**.
- F. After completion of testing and/or inspection remove all equipment and implements of service, and debris.
 1. Leave entire area in a neat, clean, acceptable condition.

END OF SECTION 01 45 29

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 General Requirements apply to the work of this Section.
- B. The **General Contractor** is responsible for all costs associated with temporary utilities during construction.
- C. Temporary facilities and controls required for this Work include, but are not necessarily limited to:
 - 1. Temporary utilities including, but not limited to;
 - a. Gas
 - b. Water
 - c. Electricity
 - d. Telephone
 - 2. Field office.
 - 3. Sanitary facilities.
 - 4. Fencing of construction area.
 - 5. Protective fencing for existing vegetation
 - 6. Parking of vehicles.
 - 7. Egress plan.

1.2 RELATED WORK

- A. Utility hookups: pertinent Specification Sections.

PART 2 - PRODUCTS

2.1 TEMPORARY UTILITIES

- A. General: Furnish water, gas and electricity required during construction and extend temporary service lines to construction areas for use of all Subcontractors.
- B. Temporary water:
 - 1. **General Contractor** may connect a temporary line to the existing water service lines at the site.
 - 2. The **General Contractor** shall be responsible to verify all existing conditions associated with a water connection.
 - 3. Connections to existing water service lines shall be coordinated with and accepted by the Project Inspector.
 - 4. Water used in construction must comply with Section 16 of the Standard Construction Specifications.

5. Provide ample supply of potable water for all purposes of construction at point convenient to Project. Pipe water from source of supply to all points where water will be required.
 6. Provide sufficient hose to carry water to every required part of construction and allow use of water facilities to Subcontractors engaged on Work.
- C. Temporary electricity:
1. The **General Contractor** shall arrange for and shall install power service from electrical service provider service lines, or shall provide a portable generator.
 2. Electric service: Construct all temporary electric facilities and maintain in accordance with Division of Industrial Safety "Electrical Safety Orders" (ESO), Public Utilities Commission "Rules of Overhead Line Construction" (G.O. 95), and CAL-OSHA. Materials, devices and equipment used for these facilities shall be in good and safe condition but need not be new.
- D. Temporary heating: Provide heat, ventilation, fuel and services as required to protect all work and materials and to keep humidity down to extent required to prevent corrosion of any metal and to prevent dampness or mildew which is potentially damaging to materials and finishes. In addition, provide heat and ventilation prior to and during following work operations:
1. Where applicable: At all times during placing, setting and curing of concrete, provide sufficient heat and protection to insure heating of spaces involved to not less than 50°F.
 2. From beginning of application of drywall and during setting and curing period, provide sufficient heat to produce temperature in spaces involved of not less than 55°F.
 3. For period of 7 days previous to placing of interior finish materials and throughout application of finish painting and laying of resilient flooring materials, provide sufficient heat to product temperature of not less than 60°F.
 4. After finishing trades are complete and until final acceptance of Work, provide temperature of not less than 60°F.
- E. Telephone:
1. Maintain telephone in field office for use by **Architect** and **Owner** as well as **General Contractor**.
 2. Provide and pay for telephone installation and service for field office. Maintain service for duration of operations under this Contract. Provide gongs, horns or remote control devices so that telephones may be heard throughout construction site.
 3. **General Contractor** shall not have access to phones on site and therefore, shall arrange for their own pager or portable phone if needed for on-site communication.
- F. Fax Machine:
1. Maintain fax machine in field office for use by **Architect** and **Owner** as well as **General Contractor**.
 2. Provide and pay for fax machine telephone service installation and service for field office. Maintain service for duration of operations under this Contract. Provide gongs, horns or remote control devices so that telephones may be heard throughout construction site.

2.2 FIELD OFFICE

- A. **General Contractor** shall provide at least one temporary field office for use by himself, their Subcontractors, and the **Architect**.

2.3 SANITARY FACILITIES

- A. The **General Contractor** will provide proper, adequate, sanitary toilet facilities for use of all workers employed on Project, in accordance with State and Local health departments.

2.4 TEMPORARY CONSTRUCTION, EQUIPMENT AND PROTECTION

- A. Provide, maintain and remove upon completion of Work, all temporary rigging, trench plates, scaffolding, hoisting equipment, rubbish chutes, ladders, barricades, lights and all other protective structures or devices necessary for safety of workers and public property as required to complete all Work.
- B. Walkways and barricades: Provide pedestrian walkway protection and wood barricades conforming to Jurisdiction standards and requirements.
- C. Temporary fencing: Provide chain link fencing enclosures around unfenced areas of the site as required to protect pedestrians until project is complete.
- D. Protection: Protect all workers and equipment from power lines and maintain safe distances and protective devices as required by Industrial Safety Commission and CAL-OSHA.
- E. Temporary construction and equipment: All temporary construction and equipment shall conform to all regulations, ordinances, laws and other requirements of State and other authorities having jurisdiction, including insurance companies, with regards to safety precautions, operation and fire hazard.
- F. Pumping: Provide and maintain pumping facilities, including power for keeping site, excavations and structures free of accumulations of water at all times, whether from underground seepage, rainfall, drainage or broken lines. Pond discharge to get rid of sediment prior to discharge into storm drain.
- G. Damage or theft: Protect work and materials to be used on Project from damage or loss due to elements, theft, vandalism, malicious mischief, or other causes. **General Contractor** shall be held responsible for such damages or loss which he shall remedy at their expense.
- H. Provide fencing to maintain means of egress in and out of building and site.

2.5 PARKING OF VEHICLES

- A. **General Contractor** shall be responsible for job site vehicle parking of their Subcontractor's vehicles.

PART 3 - EXECUTION

3.1 MAINTENANCE AND REMOVAL

- A. Maintain all temporary facilities and controls as long as needed for safe and proper completion of Work; remove all such temporary facilities and controls as rapidly as progress of Work will permit.

END OF SECTION 01 50 00

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SECTION 01 58 13 – TEMPORARY CONSTRUCTION SIGNAGE

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the job site for placement of temporary signage.
- D. Wood framing, including posts, sheathing.
- E. Finishing, including painting of substrate and letters and numerals for signage.
- F. Framing hardware.
- G. Concrete Footings with integral gravel base.
- H. Disposal of sign assembly after **Owner** occupation of building.

1.2 QUALITY ASSURANCE

- A. Lumber and plywood source quality control: Provide materials graded under one of the following:
 - 1. Rules 17, Standard Grading Rules for West Coast Lumber, current edition - WCLIB.
 - 2. Standard Grading Rules for Western Lumber, current edition - WWPA.
 - 3. Plywood Specification and Grade Guide of American Plywood Association, current edition - APA.
- B. Grade mark each piece of lumber. Marking must be done by recognized agency. Lumber Manufacturer's Association Certificates may be accepted in lieu of such grade and trademarks.
- C. Plywood sheathing: Each panel shall be legibly identified as to type, grade and species by APA grade, comply with PS-1 (ANSI A199.1).

1.3 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. List of materials: Submit list of materials proposed to be used including posts, sheathing & hardware.
- C. Submit: Shop drawings of sign & anchorage. Sign layout shall indicate character sizes, style & spacing, type.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Division 1 product delivery, storage and handling requirements.
- B. Provide, ship to project site, and install.

PART 2 - **PRODUCTS**

2.1 FRAMING LUMBER

- A. Lumber: Coast Region Douglas Fir (DF), unless otherwise noted. Lumber designated DF South by WWPA not acceptable. All lumber new with no re-use.
 - 1. Grades not less than following:
 - a. Posts: No. 1, Pressure treated Douglas fir - free of heart center.
 - b. Plywood: Group II Exterior APA 303 Siding EXT, Smooth Face.
- B. All wood other than plywood shall be pressure treated, per building code, Chapter 23 and shall bear an AWPB stamp for P.T.D.F.
 - 1. Wood posts set into ground.
 - a. Treat all cut ends of P.T.D.F. with approved preservative.

2.2 ROUGH HARDWARE

- A. FASTENERS: Galvanized for exterior use, in accordance with ASTM A153. Select fasteners for the fastening of the plywood substrate sign to the support posts.
 - 1. Standard bolts and nuts: Carriage head type, ASTM A307, Grade A.
 - 2. Plain washers: Round, general assembly grade carbon steel, FS FF-W-92.
 - 3. Lock washers: Helical spring type carbon steel, FS FF-W-84.

2.3 SIGNAGE DESIGN

- A. General
 - 1. Size of sign panel: 4'-0" x 3/4" thick x 8'-0" long
 - 2. Supporting Posts: 4" x 4" x 10'-0"
- B. Sign design:
 - 1. General:
 - a. Refer to Drawings detail.
 - 2. Characters:
 - a. Style: Helvetica
 - b. Type: Capitals
 - c. Border: Install characters, logos, etc. such that an equal clear border of 2" occurs around perimeter.
 - d. Character height:
 - 1. Project Name: 4" tall x two lines & spaced to span sign width
 - 2. Project Address: 3" tall x full width of sign less perimeter clearance
 - 3. **Owner, Architect & General Contractor** name: 2" tall
 - 4. **Owner, Architect & General Contractor** address: 1-1/2" tall
 - e. Line spacing:
 - 1. 1" between name & address, type.

2. Equally spaced between Project name/address & **Owner** name/address, etc.
3. Color:
 - a. Background: ICI, 473, Autumn Squash, MP# 10YY 46/515
 - b. Characters: Jet Black
 - c. Misc: Install 1/4" dots spaced at 2" +/- on center below Williams + Paddon... name. Red, PPG Color no: 71654
 - d. Paint Type: Alkyd Enamel
 - e. Finish: High Gloss

PART 3 - **EXECUTION**

3.1 INSTALLATION

- A. General:
 1. Install posts straight, true, level, plumb, and place 4'-0" into 12" diameter x 3'-8" deep concrete footing. - extend 4" of post into clean gravel at base of footing.
 2. Fasten sign panel to posts with (3) carriage bolts each post & spaced evenly from bottom of sign to top.
 3. Install sign assembly such that top of posts are located 2" below top of sign panel & 2" measured from side of sign panel.
- B. Bracing:
 1. Provide temporary bracing sufficient to keep structure stable, plumb, and in line until completed.

END OF SECTION 01 58 13

SECTION 01 66 00 PRODUCT DELIVERY, STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Transport, deliver, handle and store materials and equipment at the site in a manner to prevent the intrusion of foreign matter or moisture, and to prevent damages. In all cases comply with:
 - 1. Material and equipment manufacturer's instructions regarding temperature limitations.
 - 2. Other environmental conditions, which are required to maintain the original quality of the materials and equipment.
 - 3. Minimize packaging materials to maximum extent possible while still ensuring protection of materials during delivery, storage, and handling.
- D. Packaging:
 - 1. Provide packaged material in manufacturer's original containers with seals unbroken and labels intact until incorporating into the work.
 - 2. Deliver materials in recyclable or in reusable packaging such as cardboard, wood, paper, or reusable blankets, which will be reclaimed by supplier or manufacturer for recycling.
 - a. Reusable Blankets: Deliver and store materials in reusable blankets and mats reclaimed by manufacturers or suppliers for reuse where program exists or where program can be developed for such re-use.
 - b. Pallets: Where pallets are used, suppliers shall be responsible to ensure pallets are removed from site for re-use or for recycling.
 - c. Corrugated Cardboard and Paper: Where paper products are used, recycle as part of construction waste management recycling program, or return to material's manufacturer for use by manufacturer or supplier.
 - d. Sealants, Paint, Primers, Adhesives, and Coating Containers: Return to supplier or manufacturer for re-use where such program is available.
 - 3. Unacceptable Packaging Materials: Polyurethane, polyisocyanate, polystyrene, polyethylene, and similar plastic materials such as "foam" plastics and "shrink-fit" plastics.
 - 4. Wrapped or bundled material shall bear the name of the manufacturer and the product.
- E. Remove all damaged or otherwise unsuitable material and equipment promptly from the site.
- F. Storing:
 - 1. Delineate locations for lay down, recycling, and disposal areas; using paved areas for staging activities. Construction staging and materials storage will be at areas agreed with by Owner.
 - 2. Locate storage piles, stacks or bins so as to avoid being disturbed and barricade to protect from damage of any kind.
 - 3. Store all materials and equipment:
 - a. In accordance with manufacturer's instructions.

- b. Above grade.
 - c. Properly protected from weather and construction activities.
- G. Protection:
 - 1. Protect all finished surfaces, including jambs and soffits of all openings used as passageways or through which materials and equipment are handled.
 - 2. Protect all finished floor surfaces in traffic areas before moving any material and equipment over these finished surfaces.
- H. Maintain clean and unmarred all finished surfaces to the date of acceptance. Repair of damage shall be made to the satisfaction of the **Architect** and **Owner**.
- I. Consult individual specification sections for additional specific product handling and protection requirements.
- J. Safeguards:
 - 1. During construction **General Contractor** shall provide safeguards in accordance with, but not limited to CBC Chapter 33.

1.2 RELATED SECTIONS

- A. Refer to Division 1 for construction waste management and disposal/recycling requirements.
- B. Refer to Division 1 for sustainability requirements

PART 2 - **PRODUCTS**

Not Used

PART 3 - **EXECUTION**

Not Used

END OF SECTION 01 66 00

SECTION 01 71 23 – FIELD ENGINEERING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Provide and pay for field engineering services required for Project.
 - 1. Survey Work required in execution of Project.
 - 2. Land Surveyor, Civil, or other professional engineering services specified, or required to execute **Contractor's** construction methods.
- C. Provide field staking of site improvements; identify existing survey reference points and property line corner stakes indicated on Drawings, as required.
- D. Locate and be aware of all existing on-site utility lines and improvements.
- E. Comply with all conditions of the Contract.

1.2 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Qualified state registered professional engineer or registered land surveyor, acceptable to **General Contractor, Owner** and **Architect**.
- B. A registered professional engineer of discipline required for specific service on Project, licensed in State of California.

1.3 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit name, address and California license of surveyor and professional engineer for **Architect's** and **Owner's** review.
- C. At substantial completion of project, submit for review by the **Owner** and **Architect**, Certificate documentation to verify accuracy of field engineering work.
 - 1. Submit certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.
 - a. If **Contractor** should fail to meet technical or design requirements embodied in this document and on the applicable plans, they shall make necessary readjustments until all work is deemed satisfactory as determined by the **Architect** and **Owner**.
 - b. No deviation from the specifications shall be made except upon written approval of the **Architect** and **Owner**.

PART 2 - PRODUCTS

Not Used

PART 3 - **EXECUTION**

3.1 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical survey reference points for Project are those designated on Drawings.
- B. Locate and protect survey reference points prior to staking site work, and preserve all permanent reference points during construction.
 - 1. Make no changes or reallocations without prior written notice to **Owner** or **Architect** for review and interpretation.
 - 2. Report to **Owner** when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - 3. Require surveyor to replace Project survey reference points which may be lost or destroyed. Establish replacements based on original survey control.

3.2 PROJECT SURVEY REQUIREMENTS

- A. Establish and safeguard minimum of two permanent benchmarks on project site, referenced to data established by survey reference points. Record locations, with horizontal and vertical data, on Project Record Documents.
- B. Establish and maintain lines and levels, locate and layout, by instrumentation and similar appropriate means, but not limited to, the following:
 - 1. Site improvements:
 - a. Stakes for grading, fill and topsoil placement.
 - b. Utility slopes and invert elevations.
 - 2. Batter boards for structures.
 - 3. Building foundation, column locations and floor levels, as required for specific conditions.
 - 4. Controlling lines and levels required for mechanical and electrical trades.
- C. From time to time or at **Owner's** request, verify layouts by same methods.
- D. Preserve and protect all on-site underground utilities lines and existing on-site improvements in the area of construction.

3.3 RECORDS

- A. Maintain complete, accurate log of all control and survey work as it progresses.
- B. On completion of foundations and major site improvements, prepare certified survey showing all dimensions, locations, angles, and elevations of construction.
- C. Incorporate all revisions, new work, etc. into record drawings.

END OF SECTION 01 71 23

SECTION 01 73 29 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Verify applicable dimensions, clearances and heights at the jobsite.
- C. Demolition:
 - 1. Coordinate the work of this Section with related trades.
 - a. Refer to Section 02 41 13 – Selective Site Demolition & Protection
 - b. Refer to Section 02 41 19 – Selective building Demolition & Protection
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Execute cutting, fitting or patching of work, require to:
 - a. Make parts fit properly.
 - b. Make flatwork, paving, etc. fit properly.
 - c. Uncover work to provide for installation of ill-timed work.
 - d. Remove and replace work not conforming to requirements of Contract Documents.
 - e. Remove and replace defective work.
 - f. Remove samples of installed work as specified for testing.
 - g. Do not endanger any work by cutting or altering work or any part of it.
 - h. Cut existing flatwork, paving, etc. to fit properly with new work.
 - 2. In addition to Contract requirements, upon written instructions of Architect:
 - a. Uncover work to provide for **Architect's** and/or **Inspector's** observation of covered work.
 - b. Remove samples of installed materials for testing, when required.
 - 3. The Contractor with structural responsibility within their scope of work shall solely execute structural cutting and patching required for this project.
 - 4. Cutting:
 - a. Minor cutting will be performed by both the General and Trade Subcontractors where required for the execution of their work. Locations of all trade cutting (core boring, etc.) shall be reviewed and approved by the **General Contractor**, **Owner** and **Inspector** where required.
 - 5. Patching:
 - a. Minor patching will be performed by both the General and Trade Subcontractors where required for the execution of their work. Locations of all trade cutting (core boring, etc.) shall be reviewed and approved by the **General Contractor**, **Owner** and **Inspector** where required.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. Title 24, California Code of Regulations, California Building Standards Commission
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. CBC Energy Code, California Code of Regulations, Title 24, Part 6, California Building Standards Commission
- E. Title 24, Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction:
 - a. All occupancy types.
- F. American Concrete Institute (ACI), www.aci-int.org
- G. American Institute of Steel Construction (AISC), www.aisc.org
- H. American Iron and Steel Institute (AISI), www.steel.org
- I. American National Standards Institute (ANSI), www.ansi.org
- J. American Society of Mechanical Engineers (ASME) www.asme.org
- K. American Society For Testing and Materials (ASTM), www.astm.org
- L. American Welding Society (AWS), www.aws.org
- M. American Water-Works Association (AWWA), www.awwa.org
- N. Factory Mutual (FM), www.fmglobal.com
- O. National Electrical Manufacturers Association (NEMA), www.nema.org
- P. National Fire Protection Agency (NFPA), www.nfpa.org
- Q. Occupational Safety and Health Administration (OSHA), www.osha.gov
- R. Sheet Metal and Air Conditioning Contractors, Association (SMACNA), www.smacna.org
- S. Sealant, Waterproofing and Restoration Institute (SWRI), www.swrionline.org
- T. US Environmental Protection Agency, www.epa.gov

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:
 - 1. Comply with manufacturer's standards.
 - 2. Comply with Building Code.
 - 3. Job site inspections shall be done as herein specified and as listed in drawings.
 - 4. Testing shall be done as herein specified and as listed in drawings.
 - 5. Refer to Division 1 for additional requirements for DSA Projects.

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.

- B. Submit Manufacturer's data and shop drawings.
 - 1. Prior to cutting which affects structural safety, submit written notice to **Architect** and **Structural Engineer** requesting consent to proceed with cutting.
 - 2. Prior to cutting which affects Aesthetics, submit written notice to **Architect** requesting consent to proceed with cutting.
- C. Submit 48-hour advance written notice to **Architect** and **Owner** and designating time work will be uncovered.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer/ Fabricator shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- C. Patching of openings that are cut in any fire rated walls or membranes shall be sealed tightly using approved materials only.
 - 1. Verify that fire rating envelopes are maintained or inspections provided prior to concealing work.
 - 2. Cutting and patching, if required by Agencies and/or DSA to verify adequacy of protection after concealment, shall be performed at no additional cost or time extension to the **Owner**.
- D. Stipulations:
 - 1. Should conditions of work or schedule indicate change of materials or methods, submit written recommendation to **Architect** and **Owner**, including:
 - a. Conditions indicating change.
 - b. Recommendations for alternative materials or methods.
 - c. SUBMITTALS as required for substitutions.
 - d. Quotations of charges or credits.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.

- B. Furnish initial one (1) year written warranty signed by **General Contractor** agreeing to repair and/or replace work (patching) which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related Sections include, but are not limited to the following:
 - 1. Refer to Division 1 for sustainability requirements.
 - 2. Refer to Division 1 for additional requirements for DSA projects.
 - 3. Refer to Division 1 for construction waste management and disposal/recycling requirements.
 - 4. Divisions 2 through 49.
- B. Related Documents include, but are not limited to the following:
 - 1. Refer to Division 1 for General Conditions.

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout.
 - 1. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. Each Subcontractor shall make the field measurements necessary for their work and be responsible for its accuracy.
 - 1. Should any structural difficulties prevent a Subcontractor or tradesman from installing their material properly, the **General Contractor** shall be promptly notified so that the **Architect** may be consulted as to how best to resolve the difficulty.
 - 2. Cutting into the walls and floors, if necessary, shall be carefully and neatly performed and then be repaired in an approved manner.
 - 3. The **Architect** and **Structural Engineer** shall be consulted in all cases where cutting into a structural portion of the building is either desirable or necessary so that satisfactory reinforcement or other work may be provided or installed.
- D. Patching of all exposed architectural finishes shall be performed under the supervision of the **General Contractor**, but executed by the affected finish trade Subcontractor.
 - 1. Cutting and patching of existing architectural finishes shall be minimized to the extent possible through careful routing and placement of new work.
 - 2. The **Architect** shall have the authority to reject substandard or unacceptable patching.
- E. **General Contractor** shall coordinate slab vapor emission and PH testing of concrete floors which have been sawn cut to remove portions of slab and ensure that concrete treatment within criteria of finish flooring is complete prior to the installation of finish flooring as herein specified.

1.13 VAPOR EMISSION AND ALKALINITY CONTROL COMPLIANCE

CUTTING AND PATCHING

A. Refer to Section 07 28 00 – Concrete Slab Vapor Emission and Alkalinity Control Treatment

1.14 GENERAL SYSTEM DESCRIPTION

A. Refer to drawings typically for scope of cutting and patching.

B. Cut and patch as require to complete scope of work.

C. Demolition:

1. Concrete slab on grade:

a. Refer to drawings and details.

b. Saw cut floor to remove extent of slab, but not damage existing vapor barrier.

1) Replace /patch damaged vapor Barrier.

a) Refer to Concrete Notes on structural drawings.

c. Sawn cut extent/widths shall be done as indicated and at a minimum to provide room to allow room to drill and install dowels into existing slab prior to install of new concrete.

d. Sawn cut extents of concrete/masonry shall be done to an extent necessary to remove piping, conduit, etc.

e. If water or moisture is discovered at sub base notify **Architect** immediately.

f. Schedule:

1) Construction:

a) Drill holes and install rebar dowels.

i. Refer to structural drawings for typical criteria.

a. Minimum standards, unless noted otherwise:

i). Length" 12"

ii). Spacing: 12"

iii). Size:

a. 4" thick slab: 1/2" diameter

b. 5" thick slab: 5/8" diameter

c. 6" thick slab: 3/4" diameter

d. 7" thick slab: 7/8" diameter

e. 8" thick slab: 1" diameter

c) Vapor Barrier:

i. Replace and repair any damaged vapor barrier membrane including taping new to existing.

ii. Refer to Concrete Notes on structural drawings and Section 03 30 00 – Cast-In-Place Concrete.

d) Place new concrete

i. Refer to Concrete Notes on structural drawings and Section 03 30 00 – Cast-In-Place Concrete.

2) Demolition:

a) Schedule:

- ii. Remove concrete, drill and install dowels and reinforcing, patch and replace vapor barrier and place new concrete.
 - a. Refer to structural drawings
 - b. Refer to Section 02 41 19 – Selective Building Demolition & Protection
 - b. Refer to Section 03 30 00 – Cast in Place Concrete

2. Exterior Concrete Paving:

- a. Refer to drawings and details.
- b. Saw cut concrete to remove extent of paving, but not damage existing sub base.
- c. Sawn cut extent/widths shall be done as indicated and at a minimum to provide room to drill and install dowels into existing slab prior and reinforcing at new extent to place new concrete.
- d. Sawn cut extents of concrete/masonry shall be done to an extent necessary to remove piping, conduit, etc.
- e. If water or moisture is discovered at sub base notify **Civil Engineer**, **Owner** and **Architect** immediately.
- f. Schedule:

1) Construction:

- a) Drill holes and install rebar dowels.
 - i. Refer to structural drawings for typical criteria.
 - a. Minimum standards, unless noted otherwise:
 - i). Length" 12"
 - ii). Spacing: 12"
 - iii). Size:
 - a. 4" thick slab: 1/2" diameter
 - b. 5" thick slab: 5/8" diameter
 - c. 6" thick slab: 3/4" diameter
 - d. 7" thick slab: 7/8" diameter
 - e. 8" thick slab: 1" diameter

b) Install reinforcing:.

- i. Refer to civil and structural drawings
- c) Place new concrete and finish
 - i. Refer to drawings
 - ii. Refer to Section 32 13 13 – Concrete Paving

2) Demolition:

- a) Schedule:
 - i. Remove concrete only.
 - a. Refer to Section 02 41 19 – Selective Building Demolition & Protection
 - b. Refer to drawings

3. Exterior Concrete Flatwork:

- a. Refer to drawings and details.
- b. Saw cut concrete to remove extent of flatwork, but not damage existing sub base.
- c. Sawn cut extent/widths shall be done as indicated and at a minimum to provide room to drill and install dowels into existing flatwork prior and reinforcing at new extent to place new concrete.
- d. Sawn cut extents of concrete/masonry shall be done to an extent necessary to remove piping, conduit, etc.
- e. If water or moisture is discovered at sub base notify **Civil Engineer, Owner** and **Architect** immediately.
- f. Schedule:

1) Construction:

- a) Drill holes and install rebar dowels.
 - i. Refer to structural drawings for typical criteria.
 - a. Minimum standards, unless noted otherwise:
 - i). Length" 12"
 - ii). Spacing: 12"
 - iii). Size:
 - a. 4" thick slab: 1/2" diameter
 - b. 5" thick slab: 5/8" diameter
 - c. 6" thick slab: 3/4" diameter
 - d. 7" thick slab: 7/8" diameter
 - e. 8" thick slab: 1" diameter

- b) Install reinforcing:.
 - i. Refer to Civil Drawings and structural drawings
- c) Place new concrete
 - i. Refer to Section 32 13 13 – Concrete Paving

2) Demolition:

- a. Schedule:
 - 1. Remove concrete only.
 - a. Refer to Section 02 41 19 – Selective building Demolition & Protection

2. Exterior Asphalt Paving:

- a. Refer to drawings and details.
- b. Saw cut asphalt to remove extent of paving, but not damage existing sub base.
- c. Sawn cut extent/widths shall be done to allow room to drill and install dowels into existing slab prior to install of new concrete.
- d. Sawn cut extents of concrete/masonry shall be done to an extent necessary to remove piping, conduit, etc.
- e. Schedule:

- 1) Construction:
 - a) Refer to Civil and Architectural drawings.
 - b) Place new asphalt
 - i. Refer to Section 32 12 16 – Asphalt Paving
 - ii. Refer to Civil drawings.
- 2) Demolition:
 - a) Schedule:
 - ii. Remove asphalt and place new asphalt and finish as indicated in drawings.
 - a. Refer to Civil and Structural drawings
 - a. Refer to Section 02 41 13 – Selective Site Demolition & Protection
 - b. Refer to Section 32 12 16 – Asphalt Paving

PART 2 - **PRODUCTS**

2.1 MATERIALS

- A. Materials for replacement of work removed: comply with specifications for type of work to be done.

2.2 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect Owner**.

PART 3 - **EXECUTION**

3.1 INSPECTION/EXAMINATION

- A. Verification of Conditions:
 1. Examine areas and conditions under which work is to be performed.
 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.
- B. Surface:
 1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.
- C. Inspect existing conditions of work, including elements subject to movement or damage during cutting and patching.
- D. After uncovering work, inspect conditions affecting installation of new products.

3.2 COORDINATION

- A. Refer to Section 01 31 13 – Project Coordination.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.
- B. Provide shoring, bracing and support as required to maintain structural integrity of work.
- C. Provide protection for other portions of work.
- D. Provide protection from elements.
- E. Each Subcontractor shall make the field measurements necessary for their work and be responsible for its accuracy.
 - 1. Should any structural difficulties prevent a Subcontractor or tradesman from installing their material properly, the **General Contractor** shall be promptly notified so that the **Architect** may be consulted how best to resolve the difficulty.
 - 2. Cutting into the walls and floors, if necessary, shall be carefully and neatly performed and then be repaired in an approved manner.
 - 3. The **Architect** and **Structural Engineer** shall be consulted in all cases where cutting into a structural portion of the building is either desirable or necessary so that satisfactory reinforcement or other work may be provided/installed.

3.4 INSTALLATION

- A. General:
 - 1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 - a. Proceed and provide cutting and patching as herein specified and as indicated in drawings.
- B. Performance:
 - A. Execute fitting and adjustment of products to permit finished installation to comply with specified tolerances and finishes.
 - B. Perform cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs and new work.
 - C. Patching of openings that are cut in any fire rated walls or membranes shall be sealed tightly using approved materials only.

3.5 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so their rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

- D. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- E. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- F. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- G. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- H. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- I. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- J. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's** Notice of "Certificate of Substantial Completion".

END OF SECTION 01 73 29

SECTION 01 74 00 – PROTECTION AND CLEANING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Execute protection and cleaning daily, during progress of Work, and at completion of Work, as required by General Conditions and specifications.
 - 2. Building: Keep areas of work in building free from accumulated debris, rubbish and waste materials as work progresses.
 - 3. Site: Keep areas of work within site free from accumulated debris, rubbish and waste materials as work progresses.
 - 4. Protect work and materials of each Section prior to and during installation, and protect the installed work and materials of other trades.
 - 5. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
 - 6. After completion of work in this Section, remove all equipment, tools, cleaning supplies, etc. from site.
 - 7. Provide product information, instruction manuals & warranties.
- D. Coordinate protection and cleaning with each specific specification section.
- E. Coordinate protection and cleaning with demolition work.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. Title 24, California Code of Regulations, California Building Standards Commission.
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. CBC Energy Code, California Code of Regulations, Title 24, Part 6, California Building Standards Commission.
- E. Title 24, Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction:
 - a. All occupancy types.
- F. National Demolition Association, www.demolitionassociation.com

1.3 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. **General Contractor** shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.

1.4 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.
- B. Disposal operations shall be in compliance with **General Contractor's** Construction Waste Management plan as approved by the **Owner**.
 - 1. Refer to Division 1 for construction waste management and disposal/recycling requirements.

1.5 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. All construction.
- B. Related Sections include, but are not limited to the following:
 - 1. Refer to Division 1 for sustainability requirements.
 - 2. Refer to Division 1 for construction waste management and disposal/recycling requirements.
 - 3. Division 2-49.

PART 2 - **PRODUCTS**

2.1 MATERIALS

- A. Cleaning and Maintenance Products:
 - 1. Provide data on manufacturers' recommended maintenance, cleaning, refinishing and disposal procedures for materials and products.
 - a. Where chemical products are recommended for these procedures, provide documentation to indicate that no component present in the cleaning product at more than 1% of the total mass of the cleaning product is a carcinogen or reproductive toxicant as defined in the lists in this specification section.
 - b. For purposes of reporting, identification of product VOC contents shall not be limited to those regulated under Clean Air Act (CAA) but shall also include compounds exempted from the CAA definition and listing of VOCs.
 - c. California EPA and local air district definitions of VOCs based on CAA are not sufficient as they exempt compounds based on non-reactivity for outdoor air pollution control but still important for indoor air quality.
 - d. Avoid cleaning products containing alpha-pinene, d-limonene or other unsaturated carbon double bond alkenes due to chemical reactions with ozone to form aldehydes, acidic aerosols, and ultra-fine particulate matter in indoor air.
 - 1. The State of California Department of General Services has published specifications for Environmentally Preferable Janitorial Chemicals and a list of cleaning/maintenance products meeting these specifications. Both are available on the internet at:

- a. <http://www.ciwmb.ca.gov/greenbuilding/Specs/Janitorial.doc>
 - b. <http://www.resd.dgs.ca.gov/BPM/lists.htm>
- B. These procedures are for final General Contractor cleaning of the project prior to substantial completion and for provided materials and products as required by the specific specification sections.
- C. Use only those cleaning materials and methods recommended by manufacturer of surface material to be cleaned and which will not damage surfaces.
- D. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

2.2 CHEMICALS OF CONCERN

- A. Chemicals of Concern include but are not limited to those chemicals listed below as toxic air contaminants, carcinogens, teratogens, reproductive toxins, and chemicals with established Chronic Reference Exposure Levels (REL):
- B. Carcinogens: Chemicals listed as probable or known human carcinogens in the latest published edition of the following two lists:
1. California Environmental Protection Agency, Air Resources Board (ARB), list of Toxic Air Contaminants (California Air Toxics). <http://www.arb.ca.gov/toxics/summary/summary.htm>.
 2. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA), Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html.
- C. Reproductive Toxicants: Chemicals known to cause reproductive toxicity including birth defects or other reproductive harm in the latest published edition of the following list: California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA), Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). http://www.oehha.ca.gov/prop65/prop65_list/Newlist.htm.
Chemicals with established Chronic Reference Exposure Levels (REL): Chronic RELs have been developed for 65 hazardous airborne substances as of January 2001. A chronic REL is an airborne concentration level that would pose no significant health risk to individuals indefinitely exposed to that level. RELs are based solely on health considerations, and are developed from the best available data in the scientific literature. The California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA) establishes and publishes RELs.
- D. Chronic Reference Exposure Levels for organic chemicals with possible indoor sources, based on the California OEHHA list.
1. Do not use any of the chemicals listed in the list.
 2. The most recent list may be found at: http://www.oehha.org/air/chronic_rels/allChrels.html

PART 3 – EXECUTION

3.1 DURING CONSTRUCTION & DEMOLITION

- A. also to the following section and the most restrictive shall govern:
1. Refer to Division 1 for construction waste management and disposal/recycling requirements.

- B. Demolition work, cleaning and protection refer also to the following sections and the most restrictive shall govern;
 - 1. Refer to Division 1 for construction waste management and disposal/recycling requirements.
 - 2. Section 02 41 13 – Selective Site Demolition & Protection.
 - 3. Section 02 41 19 – Selective Building Demolition & Protection.
- C. Execute periodic cleaning to keep Work, site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.
- D. Provide on-site containers for collection, disposal and/or recycling of waste materials, debris and rubbish in compliance with **General Contractor's** Construction Waste Management Plan as approved by **Owner**.
 - 1. Refer to Division 1 for construction waste management and disposal/recycling requirements.
- E. Protect material and work as recommended by manufacturer, drawings and as specified.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
 - 2. Remove masking tape immediately after tooling joints, leaving finished work in neat and clean condition.
 - 3. Clean all surfaces, materials, etc. free of dust and dirt.
 - 4. Clean up and leave premise broom clean and vacuum cleaned; clean adjoining work spotted or otherwise defaced by work of this Section.
- F. Moisture Protection:
 - 1. Moisture Stains:
 - a. Materials with evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials;
 - 1. Immediately remove from site and properly dispose.
 - 2. Take special care to prevent accumulation of moisture on installed material and within packaging during delivery, storage, and handling to prevent development of molds and mildew on packaging and on products.
 - b. Immediately remove from site and properly dispose of materials showing signs of mold and signs of mildew, including materials with moisture stains.
 - c. Replace moldy materials with new, undamaged materials.
 - d. Mitigate and remove all mold and mildew discovered.
 - 2. Ducts:
 - a. Seal ducts during transportation, delivery, and construction to prevent accumulation of construction dust and construction debris inside ducts.
 - 3. Protect interior materials from water intrusion or penetration; where interior products not intended for wet applications are exposed to moisture, immediately remove from site and dispose of properly.
 - 4. Protect installed products using methods that do not support growth of molds and mildews.
 - a. Immediately remove from site materials with mold and materials with mildew.
- G. Dust Protection:

1. Clean interior spaces prior to start of finish painting and continue cleaning on as-needed basis until painting is finished.
2. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

3.2 FINAL CLEANING

- A. Employ skilled workers for final cleaning.
- B. Comply with specific requirements as indicated in each specification section.
- C. Comply with applicable regulatory requirements during the conduct of cleaning, disposal and recycling operations and in compliance with **General Contractor's** Construction Waste Management Plan as approved by **Architect** and **Owner**.
- D. Use cleaning materials which will not create hazards to health or property or cause damage to products or Work.
 1. Refer to Table 1, Part 2 as herein specified for disallowed chemicals.
- E. Use cleaning materials and methods recommended by the manufacturers of the products to be cleaned and as described in Part 2 of this specification section.
 1. Most restrictive shall govern.
- F. Cleaning:
 1. Using cleaning and maintenance products as described in Part 2 of this Section and as specifically required per each applicable specification section, including, but not limited to;
 - a. General:
 1. Remove dust, dirt, grease, stains, fingerprints, labels, spilled and spattered, and other foreign materials from interior and exterior surfaces exposed to view.
 2. Polish transparent and glossy surfaces to a clear shine.
 3. Vacuum dust and dirt from all surfaces.
 - b. Flatwork and Paving:
 1. Clean hard surface flatwork and paving.
 2. Power wash all exposed flatwork and paving.
 - a. Stained and/or polished finish floors shall be cleaned and polished in accordance with related specification section for floor finish.
 - c. Flooring:
 1. Clean hard surface finish flooring, such as, but not limited to; tile, stone, VCT, linoleum, cork, hardwood, etc., in accordance with manufacturer's cleaning, polishing and maintenance recommendations.
 2. Broom, vacuum and wet mop all exposed concrete floors.
 - a. Stained and/or polished finish floors shall be cleaned and polished in accordance with related specification section for floor finish.
 3. Vacuum carpeted and soft surfaces with high efficiency particulate arrestor (HEPA) vacuum.

- a. Final cleaning shall be "Vacuum Clean".
- d. Walls:
 - 1. Clean surface of finish wall materials in accordance with manufacturer's cleaning and maintenance recommendations.
 - 2. Remove all fingerprints, scuff marks, etc. from painted gypsum board.
 - a. Repaint all area's that cannot be cleaned to like new appearance.
- e. Ceilings:
 - 1. Clean surface of finish wall materials in accordance with manufacturer's cleaning and maintenance recommendations.
 - 2. Remove all fingerprints, scuff marks, etc. from painted gypsum board.
 - a. Repaint all area's that cannot be cleaned to like new appearance.
- f. Exterior Wall Glazing:
 - 1. Wash and shine glazing and mirrors to be free of streaks.
- g. Interior Wall Glazing:
 - 1. Wash and shine glazing and mirrors to be free of streaks.
- h. Electrical Fixtures:
 - 1. Clean surface of finish lighting fixtures to be free of dust, finger prints etc. to a new appearance.
 - 2. Clean out debris, bugs, etc. which have accumulated inside fixture lens.
 - 3. Vacuum and wipe insides of electrical and low voltage panels, racks and cabinetwork.
- i. Fixtures:
 - 1. Clean equipment and fixtures to sanitary condition.
- j. HVAC and ventilation system and components:
 - 1. If ducts were not sealed during construction, and contain dust or dirt, clean ducts using HEPA vacuum immediately prior to Substantial Completion and prior to using ducts to circulate air.
 - 2. Replace all air filters installed at air handling units and ducts before and during construction.
 - 3. Oil film on sheet metal shall be removed before shipment to site.
 - a. However, ducts shall be inspected to confirm that no oil film is present.
 - 1. Remove oil using cleaning and maintenance products as described in Part 2 of this Section.
- 2. Recycled materials:
 - a. Remove and properly recycle materials removed during construction work, refer also to;
 - 1. Refer to Division 1 for construction waste management and disposal/recycling requirements and as described in **General Contractor's** Construction Waste Management Plan as approved by the **Owner**.

- b. Demolition - Remove and properly recycle materials removed during demolition work, refer also to;
 - 1. Waste management program, refer to;
 - a. Refer to Division 1 for construction waste management and disposal/recycling requirements and as described in **General Contractor's** Construction Waste Management Plan as approved by the **Owner**.
- 3. Demolished materials:
 - a. Remove and properly dispose of all demolished materials during demolition work, refer also to;
 - 1. Section 02 41 13 – Selective Site Demolition & Protection
 - 2. Section 02 41 19 – Selective Building Demolition & Protection
 - 3. Refer to Division 1 for construction waste management and disposal/recycling requirements and as described in **General Contractor's** Construction Waste Management Plan as approved by the **Architect** and **Owner**.
- 4. Waste materials:
 - a. Remove and properly dispose and recycle all waste materials during construction work, refer also to;
 - 1. Refer to Division 1 for construction waste management and disposal/recycling requirements and as described in **General Contractor's** Construction Waste Management Plan as approved by the **Owner**.
 - b. Demolition - Remove and properly dispose and recycle all materials during demolition work, refer also to;
 - 1. Refer to Division 1 for construction waste management and disposal/recycling requirements and as described in **General Contractor's** Construction Waste Management Plan as approved by the **Owner**.
 - 2. Section 02 41 13 – Selective Site Demolition & Protection
 - 3. Section 02 41 19 – Selective Building Demolition & Protection
- 5. Exterior:
 - a. Clean site and roof areas of sticks, rubbish, and other debris.
 - b. Broom and power wash all flatwork and paving.
 - c. Clean all finish paving materials such as brick, interlocking pavers, etc. in accordance with the specific manufacture.
 - d. Broom-clean exterior paving.
 - e. Rake clean ground surfaces.
 - f. Coordinate cleaning, protection and maintenance with all Division 2 sections.
- G. Prior to final inspection or **Owner** occupancy, **General Contractor** shall conduct inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that entire Work is clean.

END OF SECTION 01 74 00

SECTION 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL/RECYCLING

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Construction Waste Management Plan

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- C. Title 24, Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

- 1. Comply with manufacturer's standards.
- 2. Comply with Building Code.
- 3. Comply with "Construction Waste Management Plan".

B. Construction Monitoring/Observations by others:

Item	Name of Test	Performance Results	By Whom
As indicated in Waste Management Plan	Const. Waste Management	Comply	As herein indicated and in Waste Management Plan document

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for five (5) years providing/installing/finishing projects of similar size and complexity.
- C. Regulatory Requirements: Comply with all applicable federal, state, and local ordinance and regulation requirements for recycling and waste management.
- D. Disposal Sites, Recyclers, and Waste Management Processors: Use only facilities properly permitted by State and Local authorities.
- E. Construction Waste Management Plan
 - 1. The **General Contractor** shall prepare a Construction Waste Management Plan and submit to the **Owner** and **Architect** for review within 21 days after the date of the Notice to Proceed.
 - 2. The Construction Waste Management Plan shall identify the means and methods by which the **Contractor** will achieve the project's recycling goals.
 - 3. Make any revisions to the Construction Waste Management Plan per **Architect's** review comments. Submit the revised plan to the **Owner** and **Architect** for final approval.
- F. Implementation of Construction Waste Management Plan:
 - 1. Designate an on-site party responsible for instructing workers and implementing the Construction Waste Management Plan.
 - 2. Distribute copies of the Construction Waste Management Plan to the job site foreman, superintendent, and each subcontractor.
 - 3. Include Waste Management and recycling in worker orientation.
 - 4. Provide instruction on appropriate separation, handling, recycling and salvaging methods to be used by all parties at the appropriate stages of the work at the site.
 - 5. Prominently display Construction Waste Management Plan. If on-site separation is used, clearly mark all containers and areas on site dedicated to each type of recyclable material.
 - 6. Include waste management and recycling discussion in pre-fabrication meetings with subcontractors and fabricators.
 - 7. Also include discussion of waste management and recycling in regular job meetings and job safety meetings conducted during the course of work at the site.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Salvage Materials: Provide protective handling and storage as required for all items identified for salvage and reuse by the **Owner**.
- C. Recyclable Waste: Remove all recyclable materials, as identified in the Waste Management Plan, from the work location to approved containers daily. Failure to remove waste materials will be considered cause for withholding payment.
- D. Provide containers as required to comply with Construction Waste Management Plan and to prevent contamination of materials, including protection from rain and snow as applicable.
- E. Replace loaded containers with empty ones as demand requires.

- F. Handling: Deposit all materials in the containers in a clean (no mud, adhesives, solvents, petroleum contamination), debris-free condition. Do not deposit contaminated materials into the containers until such time as such materials have been cleaned.
- G. If contamination chemically combines with the material so that it cannot be cleaned, do not deposit into the containers.

1.7 JOB CONDITIONS

- A. Environmental Requirements: Transport waste materials from the Work Area to the recycle containers and carefully deposit in the containers in a manner to minimize noise and dust. Close container covers immediately after materials are deposited. Do not place recyclable waste materials on the ground adjacent to a container.
- B. Existing Conditions: Coordinate with "Instructions to Bidders" and Supplementary Conditions".

1.8 PROTECTION

- A. Protect finish surfaces at all times from work under this section.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Demolition
- B. Related Sections include, but are not limited to the following:
 - 1. Refer to Division 1 for sustainability requirements
 - 2. Refer to Division 1 for quality control requirements
 - 3. Refer to Division 1 for closeout submittal procedures
 - 4. Refer to Division 1 for protection and cleaning requirements
 - 5. Section 02 41 13 – Selective Site Demolition & Protection
 - 6. Section 02 41 19 – Selective Building Demolition & Protection

1.11 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.

1.12 DEFINITIONS

- A. Waste Materials: Construction materials that are excess to the contract requirements and which cannot be effectively used in the Work.
- B. Salvaged (or Reused) Materials:
 - 1. Construction materials recovered from existing buildings or construction sites and reused in other buildings or new building.

2. Common salvaged materials include structural beams and posts, flooring, doors, cabinetry, brick and decorative items.
- C. Recyclable Waste: Waste materials that are existing on-site or are generated during the construction process that can be recycled/remanufactured into another material.
- D. Categories of Salvageable or Recyclable waste include the following, but are not limited to;
 1. General:
 - a. Cardboard:
 1. Clean, corrugated cardboard such as used for packaging, etc.
 - b. Chemical Waste:
 1. Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic chemicals.
 - c. Co-Mingled:
 1. Several types of construction waste that are combined in a single container.
 2. Co-mingling of recycling waste must be approved by the identified recycling facility.
 - d. Hazardous Waste:
 1. Any substance whose handling and/or disposal is regulated as hazardous waste by local, state or federal authorities.
 - e. Paper Goods:
 1. Office paper: Includes any paper, such as manufacturer instructions, specification sheets, files, correspondence, packaging, stiffeners, etc.
 2. Newsprint: Shredded or whole newspaper goods.
 - f. Plastic:
 1. Beverage containers, packaging materials (such as polystyrene "peanuts" and expanded polystyrene), containers (other than those used for hazardous materials), vinyl products, etc.
 - g. Sanitary Wastes:
 1. Garbage: Refuse and scraps resulting from preparation, cooking, distribution or consumption of food.
 2. Sewage: Domestic sanitary sewage.
 - h. Source Separated:
 1. Materials that are separated on-site by Category.
 - i. Other:
 1. Any additional materials identified on-site to be valued for salvage, reuse, or recycling by the **Contractor** and **Owner**.
 2. Site:
 - a. Asphalt, Concrete, rock, brick

1. Concrete, brick, rock, broken up asphalt pavement, clay, and other inert (non-organic) materials.
- b. Fill - Inert:
 1. A permitted facility that accepts inert waste such as asphalt and concrete exclusively.
- c. Landfill – Class III and soil:
 1. A landfill that accepts non-hazardous waste such as household, commercial, and industrial waste, including construction, remodeling, repair and demolition operations.
- d. Land Clearing Debris:
 1. Solid Waste Generated from land clearing operations, such as stumps, woody debris, limbs and brush, clean soil, etc.
 2. Does not include rock, concrete or chemically treated landscape timbers.
- e. Vegetation - Existing:
 1. Includes sod, shrubs, plants, and trees that will be disturbed or removed during construction.
3. Building:
 - a. Concrete & Masonry
 1. Concrete, clay, and other inert (non-organic) materials.
 - b. Carpet and padding:
 1. Face fiber, backing, padding and carpet cushion scrap.
 - c. Fabric:
 1. Uncontaminated fabric scraps.
 - d. Glass:
 1. Includes glass beverage containers, glazing and recyclable glass building materials.
 - e. Gypsum Wallboard:
 1. Excess drywall construction materials including cuttings, other scrap and excess materials.
 - f. Insulation:
 1. Rigid foam, batt and loose fill insulation materials.
 - g. Metals:
 1. Metal Ferrous and Non-ferrous including;
 - a. Iron
 - b. Steel
 - c. Copper
 - d. Brass

- e. Aluminum
- 2. Note: Includes beverage containers, packaging materials (such as metal banding) fencing, reinforcing bar, wiring, plumbing, etc.
- h. Paints:
 - 1. Unused portions of paints, primers and coatings applied on site.
- i. Rubber:
 - 1. Uncontaminated rubber scraps, including but not limited to recycled-content rubber flooring, rubber edging, tires that are no longer serviceable, etc.
- j. Wood – clean & untreated:
 - 1. Dimensional lumber
 - 2. Wood edging
 - 3. Wood shipping pallets
 - 4. Wood misc. components/materials
- k. Wood – clean & engineered products:
 - 1. Plywood
 - 2. Oriented strand board
 - 3. Masonite
 - 4. Particleboard
 - 5. Manufactured trusses and beams
 - 6. Glue-laminated timbers.
 - 7. Rough sawn lumber/timber
- 4. Exclusions:
 - a. As herein listed

1.13 GENERAL SYSTEM DESCRIPTION

- A. The Construction Waste Management goal for this project is:
 - 1. Minimum of percentage of total Project waste shall be diverted from landfill.
- B. The **Contractor** shall develop a Waste Management Plan as defined in this Section and submit for review by the **Owner** and **Architect**.
- C. **Contractor** shall implement procedures to minimize the creation of construction and demolition waste on the job site. As many of the waste materials as economically feasible shall be reused, salvaged or recycled. Waste disposal in landfills shall be minimized.
- D. The **Contractor** shall provide and submit documentation throughout construction that waste management, recycling and re-use of recyclable and re-useable materials are being maximized.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Products are acceptable to use as intended for waste management work.

2.2 MATERIALS

- A. As necessary by contractor to complete their work and used for the purpose of demolition, etc. as herein specified and additionally as indicated in contract documents.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for complete and proper demolition activities, as selected by the **General Contractor** subject to the approval of the **Architect**.

2.4 CONSTRUCTION WASTE MANAGEMENT PLAN

- A. References for Additional Information:

1. California State Agency Buy Recycled Campaign, The Department of General Services and the California Integrated Waste Management Board www.ciwmb.ca.gov/buyrecycled/stateagency
2. Refer to Division 1 for sustainability requirements

- B. Construction Waste Management Plan:

1. **Contractor** shall develop a construction waste management plan indicating proposed methods for collection, segregation, and removal of all construction wastes and debris produced by the work of this Contract.
2. Those waste materials produced during the course of this Contract that can be recycled cost-effectively, shall be.
3. The Waste Management Plan shall include, at a minimum, the following:
 - a. Provide an analysis of jobsite waste to be generated, including types and quantities.
 - b. Provide strategies for salvage, reuse, or recycling for a minimum of all materials listed below. Include additional waste materials that are deemed cost-effective to salvage, re-use or recycle. See "Definitions" above for material categories.
 - c. Provide documentation to justify decision not to recycle any items listed below.
 - d. **Contractor** may choose on-site separation or co-mingled with off-site separation.
 1. Method chosen shall be documented.
 - e. Show compliance with applicable State and Local ordinances and regulations.
 - f. Identify and document construction waste haulers and recyclers which will handle the designated material.
 - g. Include participation in and procedures for recycling/re-use program.
 - h. Include participation in and procedures for rebate programs.
 - i. Identify materials that are not recyclable or otherwise conservable that must be disposed of in a landfill or other means acceptable under governing State and Local regulations.
 - j. Indicate any instances where compliance with requirements of this Section does not appear to be possible and request resolution from **Owner**.
4. **Contractor** shall submit Construction Waste Management Plan for review and approval as part of Submittal process.

5. Review of Contractor's Waste Management Plan shall not relieve **Contractor** of responsibility for control of pollutants and other environmental protection measures.
- C. Waste Materials: The following materials shall be salvaged and/or recycled according to this specification and the other specific product specifications.
 1. Strategies for salvage and recycling shall be identified in the Waste Management Plan as required.
 2. Salvage Materials: Identify materials existing on site that are candidates for salvage and re-use, either on this Project or through sale or donation to local organizations.
 3. Recyclable Materials: Materials including, but not limited to the following shall be considered for salvage or recycling.
 - a. Schedule: Applies to all waste materials produced during the course of this Contract, as listed in drawings and as specified in other sections to include, but not be limited to:
 - 1) General:
 - a) Cardboard
 - b) Paper Goods
 - c) Chemical Waste
 - d) Co-Mingled materials
 - e) Hazardous Waste
 - f) Plastic
 - g) Sanitary Wastes:
 - h) Source Separated materials
 - i) Other material valued for salvage, reuse and/or recycling
 - 2) Site:
 - a) Sand
 - b) Asphalt
 - c) Concrete
 - d) Masonry
 - e) Brick
 - f) Rock
 - g) Rebar
 - h) Fill - Inert:
 - i) Landfill – Class III and soil
 - j) Land Clearing Debris
 - k) Vegetation - Existing
 - 3) Building:
 - a) Concrete
 - b) Precast concrete
 - c) Masonry
 - d) Brick
 - e) Rebar
 - f) Glass
 - g) Gypsum board

- h) Insulation
 - i) Metal
 - j) Paint
 - k) Rubber
 - l) Wood – clean and untreated
 - m) Wood – clean & engineered products
- 4) Exclusions:
 - a) Pressure treated or creosote treated wood
 - b) Non-Recyclable Waste:
 - i. All waste materials that cannot be recycled, due to contamination, lack of recycling facilities or salvage options or high-cost.
- D. Delivery Receipts: Maintain copies of all delivery receipts for waste materials sent to permitted waste materials processors or recyclers that indicate the location and name of firm accepting recyclable waste materials, types of materials, net weights of each type, which materials have been recycled, and date of delivery.
- E. Maintain working copy of Construction Waste Management Plan at site for review by **Owner, Architect** and all Trades involved in Project.
- F. Participation in Recycling/Re-Use and/or Rebate Programs: Rebates, Tax Credits, and other savings obtained for recycled or re-used materials shall accrue to the **General Contractor**.

PART 3 - **EXECUTION**

3.1 INSPECTION/EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
 - 1. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work in accordance with Waste Management Plan

3.4 INSTALLATION/IMPLEMENTATION

- A. General:

2. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.

B. Waste Management

1. General: Implement waste management procedures in accordance with Construction Waste Management Plan as approved by **Owner**. Maintain procedure throughout the life of this Contract.
2. On-Site Source Separation (when this method is used by the **General Contractor**). Separate, store, protect, and handle at the project site all identified recyclable and salvageable waste products to prevent contamination of materials and maximize recycling and salvage of materials. Clearly label all recycling containers and list acceptable and unacceptable materials.
3. Collection: Arrange for timely pickups from the site or deliveries to approved recycling facilities of designated waste materials to keep construction site clear and prevent contamination of recyclable materials. Maintain records accessible to the **Owner** for verification of construction waste materials recycling.
4. Delivery Receipts: Keep and maintain records of all deliveries to recycling facilities and all pickups of waste materials at the site by others as specified above.
5. Salvage and Re-use: Identify salvage and re-use options for all materials that are deemed to be re-usable, but will not be re-used on this Project.
6. Non-Recyclable Waste: Collect and segregate non-recyclable waste for delivery to a permitted landfill site.
7. Hazardous Waste: Control and dispose of hazardous waste in accordance with local, state, and federal regulations.

3.5 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so their rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Refer to Division 1 for closeout submittal procedures.

- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor**'s NOTICE of "Certificate of Substantial Completion".

END OF SECTION 01 74 19

SECTION 01 78 00 – CLOSEOUT SUBMITALS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. **General Contractor** shall furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 1. As-Built Documents: (Record of As-Built conditions during construction)
 - a. Keeping and recording of progress As-Built Drawings and Specifications during construction.
 - 1) Includes record keeping for site demolition work
 - b. Distribution of Draft As-Built Drawings and Specifications at project closeout for review by **Architect** and **Owner**.
 - c. Distribution to **Architect** and **Owner** of final As-Built drawings and Specifications once contractor has addressed all comments by **Owner** and Design team.
 2. O & M Manuals:
 - a. Compilation of O&M Manuals in hard copy format and distribution to the **Owner** and **Architect** as a Submittal for review and comment.
 - b. Application of **Architect** and **Owner** revisions and re-submittal for final review.
 - c. Upon reviewed approval, issuance of finalized O&M manuals in the following formats:
 - 1) One (1) PDF File
 - 2) One (1) hard copy set
 3. Project Closeout
 - a. Punch Lists / Corrective Construction:
 - 1) Initiate project closeout by providing a comprehensive list of all items to be completed and corrected.
 - b. Testing, Inspections and adjusting:
 - 1) Perform all tests and inspections in accordance with plans and specifications.
 - c. California Energy Code Compliance:
 - 1) Observe all testing, document and complete all forms for compliance.
 - d. Commissioning and Balancing:
 - 1) Check all mechanical equipment, electrical lighting, etc. for compliance with design, codes and standards.
 - e. Operation, Maintenance and System Demonstration:

- 1) Train **Owner** personnel in operation and maintenance of all equipment, mechanical equipment, hardware, etc.
- f. Green Building Standards, California:
 - 1) Document that all required, specified and indicated California Green Building Standards have been addressed.
 - 2) All documentation shall be included in O&M manual.
- g. Warrantees / Guarantees / Bonds:
 - 1) Before final payment, furnish to the **Owner**, through the **Architect**, all written warranties of work and equipment installed under the contract.
 - 2) Obtain specified bonds.
- h. Insurance
 - 1) Notify the Owner of any changes in insurance coverage requirements.
- i. Certificate of Occupancy:
 - 1) Obtain this and similar releases that permit the **Owner's** full and unrestricted use.
- j. Extra Stock & Spare parts
- k. Final Cleaning
- l. Keying and Keying Schedule
- m. Certificates, Affidavits and Records
- n. Agency related submittals

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. Title 24, California Code of Regulations, California Building Standards Commission
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. CBC Energy Code, California Code of Regulations, Title 24, Part 6, California Building Standards Commission
- E. Title 24, Chapter 11 – California Green Building Standards Code
 1. Non-residential new construction:
 - a. All occupancy types.

1.3 PARTIAL OCCUPANCY

- A. The **Owner** has the right to use or occupy the building or any part thereof, or to use equipment installed under the contract, prior to final acceptance.
- B. Substantially completed portions of Work shall be designated and authorized with Certificate of Substantial Completion (AIA Document G704) for **Owner's** occupancy prior to completion of entire Work.
 1. Refer to document herein attached.

2. Owner shall use or occupy the building site following issuance of Certificate of Substantial Completion (AIA Document G704).
- C. **Owner** will occupy designated areas for purpose of installing **Owner**-furnished items.
- D. **Contractor** shall allow:
 1. Access for **Owner** personnel.
 2. **Owner** use of parking facilities.
- E. Upon occupancy the following shall be provided by **General Contractor** unless otherwise approved and contracted to be provided by **Owner**:
 1. Maintenance
 2. Security
 3. Insurance

1.4 AS-BUILT DRAWINGS / DOCUMENTS

A. As-Built Drawings / Documents

1. General:
 - a. Show materials, size and depth from surface of said installations, as well as line followed
 - b. In addition the **General Contractor** shall keep accurate record of all dimensioned items including such things as walls, ceilings, etc., where installed items differ in location from where dimensioned on the Drawings.
 - c. Do not permanently conceal any work until required information has been recorded.
 - d. Ensure entries are complete and accurate.
 - 1) All information entered on As Built documents during course of project shall be neat, legible and emphasized by drawing "clouds" around changed items. Format of changed items on drawings shall be acceptable to **Architect**.
 - 2) Actual information must be entered in documents, just a note as to the ASI, RFI number, etc. is not acceptable.
 - 3) All symbols and designations used in preparing As Built documents shall match those used in Contract Drawings and Specifications.
 - e. Keep record information current (within 7 days) with construction progress.
 - f. Label each document "Progress As-Built Documents" in large, neat, printed letters and store separate from those used for construction.
 - g. **Architect** and their consultants will not release electronic files to any parties unless agreed upon in writing.
 - 1) Architect shall issue waiver release of liability form for signatures prior to release of any electronic files agreed upon.
2. Documentation:
 - a. As-Built Conditions: Maintain on the construction site, one hard copy set of the following to record as-built conditions, (which record actual revisions to the work to generate final As-Built documents), including, but not limited to;
 - 1) Drawings
 - 2) Specifications / Project Manual

- 3) Addenda
 - 4) Requests for Information (RFIs)
 - 5) Clarifications
 - 6) Construction Change Directives (CCDs)
 - 7) Change orders (CO) and other modifications to the contract
 - 8) Reviewed shop drawings, product data & samples
 - 9) Manufacturer's instruction for assembly, installation, operation and maintenance.
 - 10) Storm Water Pollution Prevention Plan
 - 11) Mock ups
- b. Underground Work: At the time of installation **General Contractor** shall record, to scale where possible or by figured dimensions, installed locations of all underground or concealed work, including but not limited to:
- 1) Plumbing
 - 2) Electrical
 - 3) HVAC
 - 4) Low voltage
 - 5) Controls
 - 6) Fire alarm
- c. Site demolition: During demolition, record conditions of found items and/or items discovered to differ from design understanding documentation, including but not limited to:
- 1) Utilities & termination points
 - 2) Line voltage cabling and conduits
 - 3) Low voltage cabling and conduits
 - 4) Abandoned utilities, man holes, etc.
3. Standards
- a. Drawings:
- 1) Legibly mark and record the following kinds of actual construction (as-built) information including, but not limited to:
 - a) Changes made by Clarifications, RFI's, Construction Change Directives (CCD), Change Orders (CO) verbal confirmations and other modifications described in these Specifications, General Conditions, Addenda, and **Owner** accepted non-conforming work during the construction period.
 - b) Locations of Work buried under and outside the building, such as plumbing, gas, sewer and electrical lines and conduits.
 - c) Locations of significant Work concealed inside the building whose general locations have been changed from those shown on the Contract Documents.
 - d) Locations of items, not necessarily concealed, which have been changed with the **Owner's** prior acceptance, from the location shown on the Contract Documents.
 - i. Locate main runs of piping, conduit, ductwork, and similar items by dimensions.
 - ii. Locate other items either by dimensions or in relation to spaces within the building.

- iii. Note any changes to grades and or elevation changes.
 - iv. Furnish additional drawings as necessary for clarification of relocated work by **General Contractor**.
 - v. Record deviations from the sizes, locations, and other features of installation shown in the Contract Documents.
 - a. Establish locations of underground Work by dimension to column lines or walls, locating turns, and by referenced centerline and invert elevations and rates of fall.
 - vi. Indicate field changes in dimensions and detail.
 - e) Exact dimensioned location of all utilities underground within the construction limit lines inside and outside the building.
 - f) Depth of various elements of the foundation in relation to the ground level.
 - g) Locate and dimension all work including stubs for future connections, with reference to permanent landmarks or buildings and indicate depth below finish grade.
- b. Project Manual / Specifications:
- 1) Note all manufacturers, model numbers, quantities, etc. which have been changed and/or added.
 - 2) Legibly mark and record at each product section a description of the actual products installed, including the following:
 - a) Manufacturer's name, product model & number, finish & color
 - b) Product substitutions or alternates utilized.
 - c) Changes made by addenda and modifications.
4. Preliminary As-Built Documents – Review/Preliminary
- a. At time of acceptance of the Work and prior to final payment, formalize the Progress As-Built Documents (drawings and specifications) kept during the course of construction to prepare and issue a "Preliminary As-Built Documents" package consisting of drawings, specifications, and other items necessary in PDF format.
 - 1) PDF file(s) shall be supplied to **Owner** and **Architect** on a CD / DVD or uploaded to the 19six FTP site
5. Final As-Built Documents – Final Submission
- a. After incorporating **Owner**, **Architect** and Project Consultants review comments and prior to final payment, formalize the Documents (drawings and specifications) to prepare a "Final As-Built Documents" package consisting of drawings, specifications, and other items necessary in PDF format.
 - 1) PDF file(s) shall be supplied to **Owner** and **Architect** on a DVD or uploaded to the 19six Architects FTP site (Newforma Information Exchange).
 - b. Additionally, **General Contractor** will deliver one (1) hard copy of the Final As-Built Documents to the **Owner**.
 - c. Sign and date package of "Final As-Built Documents" and submit them to the **Owner** and **Architect** at time of final acceptance of the Work.

- d. Contract shall not be deemed to be completed, nor shall final payment become due until the above requirements have been complied with.

1.5 O & M (Operation and Maintenance) MANUALS

A. General:

1. All items with moving parts shall be included in the O & M Manuals.
2. All electrical and low voltage items/devices shall be included in the O & M Manuals.
3. All HVAC components shall be included.
4. All controls shall be included.
5. All specific specification sections which require O & M Manuals shall be included.
6. Cleaning recommendations shall be included for the following:
 - a. Finish flooring
 - b. Glass and glazing
 - c. Plastics
 - d. Laminates
 - e. Wall finishes, including, but not limited to;
 - 1) Wall covering
 - 2) Ceramic tile, stone and porcelain tile
 - 3) Pre-finished materials
 - f. Ceiling finishes
 - g. Finish hardware
 - h. HVAC filters - replaced

B. Manuals shall include for each specific item, product, assembly, etc:

1. Record data, maintenance and operating instructions.

C. O&M Manuals shall be submitted to the **Architect** in hard copy format for review and comment as part of the Submittal review / Closeout process.

1. **General Contractor** shall submit initial O&M manual(s) for review and comment.
2. **Owner, Architect** and design team shall review manual(s) and return with comments for inclusion into final O&M manual(s).
3. **General Contractor** shall incorporate any required changes and re-submit for final review by **Architect**.
4. Upon approval, **General Contractor** will issue final O&M manuals as follows:
 - a. **Owner:**
 - 1) One hard copy set
 - 2) One DVD with the entire manual in PDF format.
 - b. **Architect:**
 - 1) One DVD with the entire manual in PDF format.

D. Format:

1. PDF Document
 - a. General:

- 1) Compile all of the required data into one PDF file.
- 2) DF file shall include, but not be limited to:
 - a) Cover Sheet
 - i. Title: "Operation and Maintenance Manual"
 - ii. Project name
 - iii. Date
 - iv. General Contractor name and contact information
 - a. Company
 - b. Project manager
 - c. Superintendent
 - d. Engineer
 - b) Table of Contents
 - i. List each specification section in numerical order and embed links to each section of the PDF file.
 - c) Data
 - i. Cover Sheet for each specification section and miscellaneous scope of work not part of a specific section
 - a. Use and fill in herein attached Cover Page (document 01700o&m)
 - ii. Operation:
 - a. Complete instructions regarding operation of equipment.
 - b. Prepare and include additional data as required for the instruction of the Owner's operating and maintenance personnel.
 - iii. Maintenance:
 - a. Complete instructions regarding maintenance of equipment, materials, etc.
 - iv. Parts:
 - a. Complete nomenclature of replaceable parts, materials, paints, etc., their part and product numbers and name, website, email and address of nearest source of parts/materials.
 - v. Extra material:
 - a. Complete list of material verified and signed by Owner.
 - vi. Warranty:
 - a. Copy of each guarantee/warranty and service contract issued for equipment, materials, work, etc.
 - b. It is allowed to have these come in later if their availability is affected by commissioning etc.
 - vii. Extraneous Data:

- a. When manufacturer's catalog pages are included, clearly indicate the items included in this installation and delete or otherwise clearly indicate data which is not applicable to this installation.

viii. Training:

- a. Description of training of personnel.
 - i) **General Contractor** to provide documentation indicating who was trained, who conducted the training and what the subject/equipment was. Refer also to applicable specification sections.

2. Hard copy manuals:

- a. Compile all the data for each specification section into multiple volumes
 - 1) 6" x D type, three-ring binders, in durable plastic sized for 8-1/2" x 11" with exterior slide in sleeves for cover sheets for each binder.
- b. Binders shall include, but not be limited to;
 - 1) Cover Sheet on front of each binder
 - a) Title: "Operation and Maintenance Manual"
 - b) Project name
 - c) Date
 - d) General Contractor name and contact information
 - i. Company
 - ii. Project manager
 - iii. Superintendent
 - iv. Engineer
 - a) Volume indicated on bottom of each cover
 - i. One, two, three, etc. as required to include all specifications.
 - 2) Table of Contents page in front of each Binder
 - a) List each specification section in numerical order.
 - 3) Divider tabs for each division
 - a) Mechanical, electrical and low voltage shall be provided in separate binders
 - 4) Data
 - a) Cover Sheet for each specification section and miscellaneous scope of work not part of a specific section
 - i. Use and fill in herein attached Cover Page
 - b) Operation:
 - i. Complete instructions regarding operation of equipment.
 - ii. Prepare and include additional data as required for the instruction of the Owner's operating and maintenance personnel.
 - c) Maintenance:

- i. Complete instructions regarding maintenance of equipment, materials, etc.
- d) Parts:
 - i. Complete nomenclature of replaceable parts, materials, paints, etc., their part and product numbers and name, website, email and address of nearest source of parts/materials.
- e) Extra Material:
 - i. Complete list of material verified and signed by **Owner**
- 5) Warranty:
 - a) Copy of each guarantee/warranty and service contract issued for equipment, materials, work, etc.
 - b) It is allowed to have these come in later if their availability is affected by commissioning etc.
 - c) Extraneous Data:
 - i. Where contents of manuals include manufacturer's catalog pages, clearly indicate the items included in this installation and delete or otherwise clearly indicate data which is not applicable to this installation.
 - d) Training:
 - i. Description of training of personnel.

1.6 PROJECT CLOSEOUT

A. General

- 1. Project closeout shall be initiated by the **General Contractor**.
 - a. Project must be ready for Beneficial Occupancy by the **Owner**.
- 2. Project Closeout procedures shall comply with this section, all other specification sections, General Conditions, Division 1 and the **Owner** / **General Contractor** contract.

B. **General Contractor** shall provide and/or coordinate the following:

- 1. Punch Lists / Corrective Construction:
 - a. Restoration of damaged and defective work
 - 1) Restore or replace, as specified or determined by the **Architect**, material and finishes damaged during construction activities at no additional expense to the **Owner**.
 - a) This period of time shall continue until **Owner** has taken complete occupancy unless agreed upon otherwise.
 - 2) Restoration shall be equal to the original Work, and finishes shall match the appearance of existing adjacent Work.
 - a) **Owner** and **Architect** shall review for acceptance and/or rejection of remedial work.
 - b. Remedial work

- 1) Remedial Work necessary owing to faulty workmanship or materials shall add no additional expense and/or time extension to contract with **Owner**.
 - 2) Work shall be coordinated with the **Owner** and performed at such time and in such manner to cause minimal interruption and inconvenience to the **Owner's** operations.
2. Testing, Inspections and Adjusting:
- a. Conduct operational tests as required to demonstrate that all systems, controls, devices, window walls, roofs, etc. have been completed and are in compliance with all requirements.
 - b. Furnish a written record of test results using recording type instruments where applicable and as directed, and label everything with appropriate specification section numbers.
 - 1) These shall be included in O&M manual
 - c. Submit required certificates of inspection.
 - d. Adjust all equipment, operating devices etc. to function in accordance with their design and required operation.
 - 1) Adjust as directed and required per commissioning.
 - e. All documentation shall be included in O&M manual.
3. California Energy Code Compliance:
- a. Observe all testing, document and complete all forms for compliance.
 - b. Refer to applicable drawings and specifications and as herein specified.
 - c. All documentation shall be included in O&M manual.
4. Commissioning and Balancing:
- a. Check all mechanical equipment, electrical lighting, etc. for compliance with design, codes and standards.
 - b. Refer to applicable drawings and specifications and as herein specified.
5. Operation, Maintenance and System Demonstration:
- a. Systems demonstration
 - 1) Prior to Final Inspection, furnish qualified personnel for on-the-job instruction and demonstrate operation of each system to **Owner's** Maintenance Staff.
 - a) Instruct personnel in operation, adjustment, and maintenance of equipment and systems, using operation and maintenance data as basis of instruction.
 - b) All training documentation shall be included in O&M manual.
 - 2) Refer to each specification section for additional information.
 - 3) Refer also to Division 1.
6. Warranties / Guarantees / Bonds:
- a. General:
 - 1) Manufacturer's, Contractor's and Installer's warranties notwithstanding, warrant the entire Work against defects in materials and workmanship for periods as indicated in specifications at a minimum from the date Certificate of Substantial Completion (AIA

Document G704) is issued and extended as indicated in each specification section and/or as specifically noted in Division One.

- a) Guaranty/Warranty periods shall be increased in accordance with specific Specification Sections.
- b) Include this information in the O & M Manual.
- 2) Guarantee/warrant or bond Work as required in the individual Specification Sections.
- 3) Warranties between the **General Contractor** and manufacturers, and the **General Contractor** and suppliers, shall not affect guarantees/warranties between the **General Contractor** and the **Owner**.
- 4) Review guarantees/warranties and bonds to verify compliance with Contract Documents.
- 5) Compile specified bonds.
- 6) Compile specified guarantees/warranties using forms included in this section
 - a) "General Contractor Warranty/Guarantee" (See attached 01 78 00WG form)
 - b) "Sub-Contractor Guarantee" (See attached 01 78 00GSC form)
- 7) Co-execute as required.
- 8) Submit to the **Architect** and **Owner** for review.
 - a) **Owner** and **Architect** will review & issue all relative comments for **General Contractor** to address.
 - b) **General Contractor** will deliver guarantees/warranties and bonds to the **Owner** after incorporation of any **Architect** and **Owner** comments and acceptance of the Work.
 - c) These warranties and bonds shall be included in O&M manuals.
7. Insurance:
 - a. Notify the **Owner** of any changes in insurance coverage requirements.
 - 1) Especially noteworthy is the transfer from the **General Contractor's** builder's risk policy to the **Owner's** comprehensive general liability policy.
 - b. Provide all certificates.
8. Certificate of Occupancy:
 - a. Obtain this and similar releases that permit the **Owner's** full and unrestricted use.
 - b. In some jurisdictions, the **Owner** must obtain a certificate of occupancy or occupancy permit, as required by a building code or zoning ordinance, before occupying the project. Apply for and show compliance with all construction requirements and inspections needed to obtain the certificate of occupancy.
 - c. A copy of the Certificate of Occupancy shall be included in O&M manual.
9. Extra Stock and Spare parts:
 - a. Deliver replacement and maintenance stock of material as specified as part of each portion of work and product.
 - b. Deliver spare parts.
 - c. Itemize all materials and have **Owner** validate and sign indicating receipt of said materials.

10. Final Cleaning:

- a. Refer to all specification sections and to Division 1 protection and cleaning
- b. Basic cleaning:
 - 1) General: (Interior and Exterior)
 - a) Upon completion of the work, remove all waste materials, debris, rubbish, tools, construction equipment and machinery and surplus material from and about the project.
 - b) Dispose of in a manner specified also in individual specification sections.
 - c) Leave Project clean and ready for occupancy
 - d) Thoroughly clean construction debris from all areas.
 - e) Use only cleaning materials recommended by manufacturer of the material and/or surface to be cleaned.
 - i. Ensure cleaning materials meet VOC and other associated criteria.
 - ii. Confine cleaning to area's only requiring the specific cleaning to protect adjacent surfaces and materials.
 - 2) Interior:
 - a) Replace all air filters in equipment.
- c. Cleaning:
 - 1) General:
 - a) Perform a final complete professional cleaning service, using experienced and/or professional cleaners, for all features and trades, except as otherwise set forth in the specifications under the work of the specific trade as follows;
 - i. Interior:

a. Plumbing fixtures:	Washed, cleaned and labels removed
b. Electrical equipment:	Cleaned and labels removed
c. Electrical Fixtures:	Cleaned and labels removed
d. Equipment:	Visible surfaces cleaned
e. Hardware:	Cleaned and polished
f. Finishes surfaces:	Cleaned and spots, blemishes and foreign material removed.
g. Finish Metals:	Cleaned and polished
h. Cabinets/Millwork:	Dusted and cleaned, including interior of cabinets/ drawers.
i. Carpeting:	Vacuumed and spots removed
j. Resilient flooring and base:	Broomed, spots removed, washed, waxed and polished.
 - 1. Refer to material manufacturer's recommend practices
 - k. Rubber flooring and base: Broomed, spots removed, washed, waxed and polished.
 - 1. Refer to material manufacturer's recommend practices

- | | |
|--|--|
| <ul style="list-style-type: none"> I. Paved surfaces: m. Concrete exposed: n. Typical: o. Windows/glazing: | <ul style="list-style-type: none"> Broom, vacuum and wash Broom, vacuum and wash Dust everything prior to additional cleaning methods. Washed and cleaned without dust and water spots |
| <ul style="list-style-type: none"> ii. Exterior: (Building) <ul style="list-style-type: none"> a. Plumbing fixtures: b. Electrical equipment: c. Equipment: d. Hardware: e. Finishes surfaces: f. Finish Metals: g. Structural steel exposed: h. Architectural steel exposed: i. Paved surfaces: j. Concrete exposed: k. Windows/glazing: l. Roof: | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> Washed, cleaned and labels removed. Cleaned and labels removed. Visible surfaces cleaned. Cleaned and polished. Cleaned and spots, blemishes and foreign material removed. Cleaned and polished. Washed and cleaned without water spots. Washed and cleaned without water spots. Power washed. Broom, vacuum and wash. Washed and cleaned without dust and water spots. Remove debris and wash. | |
| <ul style="list-style-type: none"> iii. Exterior: (Site) <ul style="list-style-type: none"> a. Plumbing fixtures: b. Electrical equipment: c. Equipment: d. Finishes surfaces: e. Finish Metals: f. Structural steel exposed: g. Architectural steel exposed: h. Paved surfaces : i. Concrete exposed: j. Planters: k. Lawn: | |
| <ul style="list-style-type: none"> <ul style="list-style-type: none"> Washed, cleaned and labels removed. Cleaned and labels removed. Visible surfaces cleaned. Cleaned and spots, blemishes and foreign material removed. Cleaned and polished. Washed and cleaned without water spots. Washed and cleaned without water spots Remove debris, broom and power wash. Remove debris, broom and power wash.. Remove debris. Remove debris. | |
| <ul style="list-style-type: none"> d. Owner's Right to Clean-up: <ul style="list-style-type: none"> 1) Should the Contractor fail to perform the Basic clean-up and specified detail clean-up, the Owner may do so and charge the associated costs thereof to the Contractor in accordance with the General Conditions. | |

11. Keying

- a. Complete the keying schedule, delivering it to the **Owner** with properly tagged master, sub-master, and room and special keys. Make final changes to lock cylinders and plan for shifting the responsibility for security to the **Owner**.
- b. Keying Schedule shall be included in O&M **manual**.
- c. Refer also to Section 08 71 00 – Door Hardware.

12. Certificates, Affidavits and Records

- a. Upon completion of the Work, the **Contractor** shall submit the following to the **Architect** and **Owner**:
 - 1) Weigh-master's affidavit for concrete as set forth in Division 1 quality control and Division 2 and 49 specification sections.
 - 2) Record of concrete placement pours.
 - 3) Certifications specifically indicated in individual specification sections and/or Division 1.
 - 4) Certificates of inspection for:
 - a) Elevators
 - b) Mechanical and Plumbing work
 - c) Electrical work
- b. This documentation shall be included in O&M manual.

13. Agency related submittals

- a. In addition to Submittals required by each specification section, also provide submittals as required by governing agencies, authorities and utilities and submit a final accounting of all these submittals.

1.7 SUBSTANTIAL COMPLETION:

- A. The **Architect's** issuance of the punch list(s) and Certificate of Substantial Completion (AIA Document G704) establishes the date of Substantial Completion.
 1. The date of Substantial Completion is the stage in the progress of the work when the work or designated portion thereof is sufficiently complete in accordance with the contract documents that the **Owner** can occupy or utilize the work for its intended use and **Owner** approves this date for issuance of certificate.
 - a. The **General Contractor**, when satisfied that the project is substantially complete according to the contract, shall prepare a punch list (comprehensive list of items to be completed and corrected) and submit it to the **Architect** and **Owner** along with the Contractor's Certificate of Substantial Completion.
 - 1) Upon receipt of the **General Contractor's** editable (Excel format) Punch List and **General Contractor's** Certificate of Substantial Completion, the **Architect** and **Owner's** Representative will observe the work to determine if it is substantially complete and generate a punch list or punch lists, to be used in addition to **General Contractor's** punch list.
 - a) **General Contractor's** may combine the two punch lists at **Architect's** discretion.

- 2) The **General Contractor** shall correct items, (whether or not they are on the punch list), that the **Architect** and **Owner** find not in accordance with the contract documents.
- b. If the **Architect** and **Owner** determine that the Contractor's Certificate of Substantial Completion and punch list have been issued prematurely, a "to do" list will be issued to the **General Contractor**, and an additional "final" observation and punch list issuance by the **Architect** will be required.
 - 1) This is an unanticipated service on the **Architect's** part, and will be charged to the **General Contractor** as an additional service.
- c. When the **Architect** and **Owner** feel that the work is substantially complete in accordance with design intent and construction documents, the **Architect** will issue the Certificate of Substantial Completion (AIA Document G704) along with the **Architect's** punch list.
 - 1) The "Substantial Completion Agreement" indicates the time allowed for completion or correction of the items, the date on which the **Owner** will occupy the work or designated portion thereof, and a description of the responsibilities for maintenance, heat, utilities, and insurance.

1.8 FINAL COMPLETION

- A. After the **General Contractor's** and **Architect's** punch list items are corrected and all other contract requirements have been satisfied as determined by the **General Contractor**, the **General Contractor** shall submit a request for the **Architect's** and **Owner's** final observation of the work and a final application for payment using "Contractor's Certificate of Final Completion" form.
 1. The final application for payment shall be prepared in accordance with The General Conditions provided the **Architect** has received the following assurances:
 - a. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which the **Owner** might in any way be responsible, have been paid or otherwise satisfied.
 - 1) **Contractor's** Affidavit of Payment of Debts and Claims shall be used for this purpose.
 - b. Consent of surety, if any, to final payment. If there is a surety company involved in the project, the **General Contractor** shall submit documents in accordance with the General Conditions, Consent of Surety, signed by an authorized official of the surety company.
- B. The General Conditions and contract associated documents require the **General Contractor** to list specifically under "exceptions" any indebtedness or known claims that have arisen in connection with the construction contract and have not been paid or otherwise satisfied. The **General Contractor** must furnish a lien bond or indemnity bond to protect the **Owner** with respect to each exception.
- C. Final payment nor any of the remaining retained percentage shall become due until the **General Contractor** submits to the **Architect** "other data establishing payment or satisfaction of all obligations, such as receipts, and releases and waivers of liens arising out of the contract to the extent and in such form as may be designated by the **Owner**."
- D. **General Contractor** shall file the "Notice of Completion" to the governing agency's Clerk.

1.9 FINAL PAYMENT

- A. After the **General Contractor** submits the final application for payment supported by the documents and data required under the General Conditions, the **Architect** with the **Owner's** assistance shall make a final check to ascertain the following:
1. The work called for by the contract has been completed.
 2. The **Owner's** interests have been protected with respect to the filing of liens as required by the general conditions and by the mechanics lien laws of the jurisdiction involved.
 3. The accounts between the **Owner** and the **General Contractor** have been adjusted, including original contract sum, additions and deductions as included in change orders and unit prices, cash allowances, deduction for uncorrected work, and any adjustments for liquidated damages.
 4. Written warranties and guarantees (such as those for roofing), as well as all certificates of inspection (such as for mechanical, plumbing and/ or electrical work), have been delivered to the **Architect** or **Owner** as required.
 6. Other conditions of the Contract have been met.
 7. Once the **Architect** and **Owner** are satisfied that everything is in order, the **Architect** will issue the final certificate for payment.

1.10 CALIFORNIA ENERGY CODE COMPLIANCE

- A. Comply with California Energy Code Standards.
- B. Comply with California Energy Code Acceptance requirements including but not limited to;
1. The installing contractor shall act as the Acceptance Agent who shall be responsible for documenting the inspection and testing results of the acceptance requirement procedures on the Acceptance Test forms.
 2. The installing contractor shall be responsible for:
 - a. Reviewing the plans and specifications and assure they conform with the acceptance requirements.
 - 1) This shall be done prior to the signing of the "Certificate of Compliance"
 - b. Performing a construction inspection prior to testing, including all necessary instrumentation, measurement and monitoring.
 - 1) Purchasing equipment with calibration certificates reduces the amount of required site calibration and may keep overall costs down.
 - 2) The purpose of the construction inspection is to assure that the equipment that is installed is capable of complying with the requirements of the Standards.
 - 3) Construction inspection also assures that the equipment is installed correctly and is calibrated.
 - c. Undertaking all required acceptance requirement procedures.
 - 1) They shall be responsible for identifying all performance deficiencies, ensuring that they are corrected and again implementing the acceptance requirement procedures until all specified systems and equipment are performing in accordance with the Standards.

- d. Correcting all performance deficiencies and again implementing the acceptance requirement procedures until all specified systems and equipment are performing in accordance with the standards.
- e. Documenting the results of the acceptance requirement procedures including paper and electronic copies of all measurement and monitoring systems.
- f. Performing data analysis, calculation of performance indices and cross-checking results with the standards.
- g. Issuing a Certificate of Acceptance.
 - 1) Building departments shall not release a final Certificate of Occupancy until a Certificate of Acceptance is submitted.
 - a) Certificate of Acceptance must demonstrate that the specified systems and equipment have been shown to be performing in accordance with the Standards.
 - b) The **General Contractor**, **Engineer of Record**, or **Owner** shall record their State of California Contractor's License number or their State of California Professional Registration License Number on each Certificate of Acceptance that they issue.
- 3. Observation of all testing
- 4. Documentation of all forms per California Energy Code and as noted on drawings.

1.11 CALIFORNIA GREEN BUILDING STANDARDS CODE COMPLIANCE

- A. Comply with California Green Building Standards Code. (CAL Green)
- B. Comply with Commissioning requirements.

PART 2 - **PRODUCTS**

Not used

PART 3 - **EXECUTION**

3.1 PERFORMANCE

- A. All work shall be done in compliance with drawings, specifications, codes and authorities having jurisdictions.

END OF SECTION 01 78 00

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CONTRACTOR'S CERTIFICATE OF FINAL COMPLETION

OWNER

ARCHITECT

TO:

19six Architects
560 Higuera Street, Suite C,
San Luis Obispo, CA 93401

PROJECT:

ATTENTION: Architect: 19six Architects

FROM: _____
(Firm or Corporation)

This is to certify that I, _____ am an authorized official
(Name of Individual)

of _____ working in the capacity of _____ and have
(Firm or Corporation) (Role)

been properly authorized by said firm or corporation to sign the following statements pertaining to the subject contract:

I know of my own personal knowledge, and do hereby certify, that the work of the contract described above has been substantially performed, and materials used and installed to date in accordance with, and in conformity to, the contract drawings, specifications, General Contractor "Punch List" and Architect's "Punch List".

The contract work is now complete in all parts and requirements, excepting the attached list of minor deficiencies and the reasons for each being incomplete to date, for which exemption from final payment requirements is requested (if no exemptions requested, write "none") _____. The work is now ready for your final inspection. The following items required from the General Contractor prior to application for final payment (such as O&M Manuals, record drawings, etc.) are submitted herewith, if any:

I understand that neither the issuance by the Architect of a Notice of Completion, nor the acceptance thereof by the Owner, shall operate as a bar to claim against the General Contractor under the terms of the guarantee provisions of the contract documents.

Signature: _____

Date: _____

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SUB-CONTRACTOR GUARANTEE

GUARANTY FOR _____
(List Scope of Work)

We hereby guarantee the work which we have furnished and/or installed in the _____ project located in _____ for ____ year, but not less than listed in each specific section, from the Certified Date of Substantial Completion. We agree to repair or replace any or all such work, together with all or any other work which may be displaced in so doing, that may be defective in workmanship or material within the period from date of acceptance without expense whatsoever to the **Owner**, ordinary wear and tear and unusual abuse or neglect excepted. This guarantee shall be in addition to and not in limitation of any other warranty or remedy required by law or by the contract documents.

In the event of our failure to comply with the above-mentioned conditions within a reasonable time after being notified in writing, we, collectively, or separately, do hereby authorize said **Owner** to proceed to have the defects repaired and made good at our expense and will pay the costs and damages therefore immediately upon demand.

Subcontractor/Material Supplier

By - Title

Signature

Date

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O&M Manual Specification Section Cover Page

Project Name: _____

Project Address: _____

Specification Section Name/Number:

Drawing Name/Number:

Scope of work description:

Subcontractor

Company Name/Address:

Contact Name:

Phone Number:

E-mail Address:

Supplier

Company Name/Address:

Contact Name:

Phone Number:

E-mail Address:

Warranty Period: ____Years

Notes:

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GENERAL CONTRACTOR'S CERTIFICATE OF SUBSTANTIAL COMPLETION

OWNER

ARCHITECT

TO:

19six Architects
560 Higuera Street, Suite C,
San Luis Obispo, CA 93401

PROJECT:

ATTENTION: Architect: **19six Architects**

FROM: _____

This is to certify that I, _____ am an authorized official of _____ working in the capacity of _____ and have been properly authorized by said firm or corporation to sign the following statements pertaining to the subject contract:

I know of my own personal knowledge, and do hereby certify, that the work of the contract described above has been substantially performed, and materials used and installed to date in accordance with, and in conformity to, the contract drawings and specifications. A list of all incomplete work is attached (Punch list).

The General Contractor hereby releases the Owner and its agents from all claims of and liability to the General Contractor for anything done or furnished for or relating to the work, as specified in the Project Manual, except demands against the Owner for the remainder of progress payments retained to date, and unresolved written claims prior to this date.

The contract work is now substantially complete, ready for its intended use, and ready for your inspection.

Signature: _____

Date: _____

Accepted By

Firm Name: _____

Signature: _____

Date: _____

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GENERAL CONTRACTOR'S AT RISK WARRANTY/GUARANTEE

WARRANTY/GUARANTEE for

PROJECT:

We hereby warrant/guarantee that the _____
which we have provided in the _____
has been completed in accordance with the requirements of specification SECTION _____ and the Contract Documents.

We agree to repair or replace any or all of our Work, together with any other adjacent Work which may be displaced by so doing, that may prove to be defective in its workmanship or material within a period of _____ months from the date of acceptance of the above-named Project by the Owner; and we also agree to repair any and all damages resulting from such defects, all without any expense to the Owner, ordinary wear and tear and unusual abuse or neglect excepted. This period of time shall be adjusted to be a longer period as indicated in each specific specification section.

In the event of our failure to comply with the above-mentioned conditions; within sixty (60) days after being notified in writing by the Owner to proceed to have such defective Work repaired or replaced and made good at our expense, and we will honor and pay the costs and charges therefore upon demand.

Signed _____ Date _____
Subcontractor's name, address and license number

Countersigned _____ Date _____
Manufacturer's name and address

((OR))

Signed _____ Date _____
General Contractor's name, address and license number

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SECTION 01 79 00 – DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Section includes: Provide equipment and systems demonstration and instruction in accordance with Contract Documents
 - 1. Videotape seminars and system demonstrations.

1.2 RELATED SECTIONS

- A. Refer to Division 1 for sustainability requirements
- B. Refer to Division 1 for project coordination requirements
- C. Refer to Division 1 for closeout submittal procedures
- D. Refer to Division 1 for Commissioning requirements
- E. Divisions 21 through 28

1.3 DESCRIPTION

- A. Seminar Agenda and Outline:
 - 1. Prepare a seminar agenda and outline in consultation and cooperation with **Owner**. Include following:
 - a. Equipment and systems which will be included in seminars.
 - b. Name of companies and representatives presenting at seminars.
 - c. Outline of each seminar's content.
 - d. Time and date allocated to each system and item of equipment.
 - 2. Submit a preliminary seminar agenda and outline for review and comment by **Owner**.
 - a. Revise and resubmit Agenda and outline until all seminar requirements have been satisfied and seminar dates and presenters have been finalized.
 - 3. Submit a final seminar agenda and outline no later than eight weeks before date of Acceptance of Work.
- B. Seminar organization:
 - 1. **General Contractor's** presentation leaders shall chair seminars.
 - a. Coordinate qualification of training personnel, seminar contents and presentations with **Owner**.
 - 2. Coordinate individual presentations and ensure manufacturer's representatives scheduled to be at training seminars are present.

3. Arrange for presentation leaders familiar with design operation, maintenance and troubleshooting of equipment and systems.
 - a. Where a single person is not familiar with all aspects of equipment or system, arrange for specialists familiar with each aspect.
 4. Coordinate proposed seminar dates with **Owner** and select mutually agreeable dates.
 5. Videotaping: arrange for videotaping of training seminars and system demonstrations, including seminar and demonstration questions and answers.
- C. Seminar Content:
1. **Commissioning Agent** will explain design philosophy of primary systems.
 2. Include following information in presentations dealing with specific systems:
 - a. An overview of how system is intended to operate.
 - b. Describe design parameters, constraints and operational requirements.
 - c. Describe system operation strategies.
 - d. Provide information to help in identifying and troubleshooting problems.
 3. Include following information in presentations dealing with equipment.
 - a. Explanation of how equipment of how equipment operates.
 - b. Recommended preventative and routine maintenance.
- D. System Demonstration:
1. Demonstrate operation of equipment and systems when specified in individual technical sections. Include following in demonstration.
 - a. Start-Up and shut down.
 - b. Operation.
 - c. Scheduled and preventative maintenance.
 - d. Troubleshooting.
 2. Demonstration may be conducted at time of original starting with **Owner's** prior approval.
- E. Seminar and Demonstration Questions:
1. Be prepared to answer questions raised by **Owner's** personnel at demonstrations and seminars.
 2. If unable to satisfactorily answer question immediately, provide written response within three days.
- F. Use manufacturer's operation and maintenance data as basis of instruction.

1.4 CONTRACTOR START-UP REPORT FORMS

- A. Videotapes: Submit two copies of each videotape; include label on each tape and on each container identifying Project and Seminar content.

PART 2 - **PRODUCTS**

Not used

PART 3 - **EXECUTION**

DEMONSTRATION AND TRAINING

Not used

END OF SECTION 01 79 00

SECTION 01 81 13 – PROJECT SUSTAINABILITY REQUIREMENTS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to as herein specified.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. CBC Energy Code, California Code of Regulations, Title 24, Part 6, California Code of Regulations, Title 24, Part 6.
- C. Title 24, Chapter 11 – California Green Building Standards Code.
 - 1. Non-residential new construction:
 - a. All occupancy types.

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:
 - 1. Title 24, Chapter 11 – California Green Building Standards Code.
- B. Standards:
 - 1. Refer to Drawings and as herein specified.
 - 2. **General Contractor** shall be responsible for full implementation of Construction BMP's, testing and monitoring in the project Storm Water Prevention Plan (SWPPP)
 - a. Plan Number: See G-002 for reference
 - b. Note: Including required reporting to the States Web site
 - 1. <https://smarts.waterboards.ca.gov/>.
- C. Construction Testing:
 - 1. Refer to Drawings and as herein specified.

1.4 SUMMARY

- A. This section lists requirements and procedures for compliance with certain Green Building Standards as set forth in the California Code of Regulations, Title 24 Part 11.

1.5 MEETINGS

- A. Refer to Division 1 project meeting requirements.

1.6 RELATED WORK/SECTIONS

- A. Related Sections include, but are not limited to:
 - 1. Division 1
 - 2. Division 1 substitution, deviation and/or submittal procedures
 - 3. Division 1 Construction Waste Management and Disposal-Recycling requirements.
- B. Divisions 2 through 49 Sections for sustainability requirements specific to the Work of each of those Sections.
- C. **The General Contractor** shall refer to Division 1 commissioning requirements.

1.7 GENERAL REQUIREMENTS

- A. The **General Contractor** shall designate an on-site field staff person to act as **the General Contractor's Sustainability Project Coordinator** for the duration of the project.
 - 1. The **General Contractor's Sustainability Project Coordinator** shall have the following qualifications:
 - a. Experience on at least 2 prior projects for:
 - 1) Preparation and implementation of Construction Waste Management Plan
 - 2) Building Commissioning
 - b. The **General Contractor's Sustainability Project Coordinator** shall facilitate the implementation and documentation of all sustainability requirements assigned to the **General Contractor**, including coordination with sub-contractors on preparation of related construction submittals.
- C. The **General Contractor** shall prepare a Construction Waste Management Plan and submit to the **Owner** and **Architect** within 30 days after the date of the Notice to Proceed and prior to the start of any work on site indicating how the following requirements will be met:
 - 1. Refer to Division 1 for construction waste management and disposal/recycling requirements
 - 2. Diversion of required percentage of construction and demolition debris from disposal in landfills and incinerators in compliance with the requirements of reference standards and as herein indicated.
 - a. Recycled amount:
 - 1) 65% recycle/reuse of nonhazardous construction and demolition waste
 - 2) Note that diversion may include donation of materials to charitable organizations and salvage of materials on site.
 - b. Identify the materials to be diverted from disposal: provide an analysis of jobsite waste to be generated, including types and quantities.
 - 1) Identify a specific area on the construction site for collection of recyclable materials.
 - 2) Identify how and where these materials will be sorted.
 - 3) Identify how these materials are to be diverted: provide strategies for salvage, reuse or recycling.

- 4) Identify where these materials will be diverted: include a list of recycling facilities to which indicated recyclable materials will be distributed for disposal.
 - 5) Identify methodology for maintaining records of recycling efforts throughout construction process.
 - 6) Identify construction haulers and recyclers to handle the designated materials.
 - c. Identify materials that are not recyclable or otherwise conservable that must be disposed of in a landfill or other means acceptable under governing State and Local regulations.
 - d. Indicate any instances where compliance with requirements of this section does not appear to be possible and request resolution from **Owner** and **Architect**.
 - e. Include participation in and procedures for recycling/re-use programs.
 - 1) Participation in Re-Use Programs: Rebates, Tax Credits, and other savings obtained for recycled or re-used materials shall accrue to the **General Contractor**.
 - f. Include participation in and procedures for rebate programs.
 - 1) Participation in Re-Use Programs: Rebates, Tax Credits, and other savings obtained for recycled or re-used materials shall accrue to the **General Contractor**.
 3. Show Compliance with applicable State and Local ordinances and regulations.
 4. The Construction Waste Management Plan shall be subject to review and approval by **Owner** and **Architect**.
 5. Review of **General Contractor's** Waste Management Plan shall not relieve **General Contractor** of responsibility for control of pollutants and other environmental protection measures.
- F. The **General Contractor** shall submit sustainability related documentation as part of construction submittals for:
1. Items defined within Division 1 sustainability requirements
 2. All materials specified in Divisions 2 through 49

1.8 CALIFORNIA GREEN BUILDING STANDARDS CODE REQUIREMENTS

A. General:

1. The **General Contractor** is responsible for maintaining all records relating to the California Green Building Standards Code sections noted herein.
2. Verification of compliance with the California Green Building Standards Code sections noted herein shall be provided by the **General Contractor** to the enforcing agency upon request.

B. California Building Standards Related Mandatory Measures Requirements:

1. Construction Waste Reduction, Disposal & Recycling (CalGreen 5.408)
 - a. Requirements:
 - 1) Prepare and implement the Construction Waste Management Plan as identified under Section 1.08 General Requirements. Update the waste management plan as may be required during construction.

- 2) **General Contractor** shall recycle and/or salvage for reuse a minimum of 50% of the non-hazardous construction and demolition debris, or meet a local construction and demolition waste management ordinance, whichever is more stringent.
 - a) **General Contractor** shall maintain waste haul tickets or other such records identifying the diversion rate achieved by the project.
 - b) Material diversion rate shall be calculated by weight or volume, but not by both in the same project.
 - c) Material diversion calculations shall exclude excavated soil and land-clearing debris.
 - 4) **General Contractor** shall provide final summary of construction waste diversion to **Owner** and Building Official at the end of the project.
2. Duct Protection (CalGreen 5.504.3)
 - a. Requirements:
 - 1) At the time of rough installation, during storage on the construction site and until final startup of the heating and cooling equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal or other methods acceptable to the enforcing agency to reduce the amount of dust or debris which may collect in the system.
 3. Finish Material Pollutant Control – Adhesives, Sealants and Caulks (CalGreen 5.504.4.1)
 - a. Requirements:
 - 1) Adhesives, sealants and caulks used on the project shall meet the requirements of the following standards:
 - a. Adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable, or SCAQMD Rule 1168 VOC limits as shown in CalGreen Tables 5.504.4.1 and 5.504.4.2. Such products also shall comply with the Rule 1168 prohibition on the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene and trichloroethylene), except for aerosol products as specified below.
 - b. Aerosol adhesives, and smaller unit sizes of adhesives, and sealant or caulking compounds (in units of product, less packaging, which do not weight more than one pound, and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of California Code of Regulations, Title 17, commencing with Section 94507.
 4. Finish Material Pollutant Control – Paints and Coatings (CalGreen 5.504.4.3)
 - 1) Requirements:
 - a. Architectural paints and coatings shall comply with VOC limits in Table 1 of the ARB Architectural Coatings Suggested Control Measure, as shown in CalGreen Table 5.504.4.3, unless more stringent local limits apply. The VOC content limit for coatings that do not meet the definitions for the specialty coatings categories

listed in CalGreen Table 5.504.4.3 shall be determined by classifying the coating as a Flat, Non-flat, or Non-flat-High Gloss coating, based on its gloss, as defined in Subsections 4.21, 4.36 and 4.37 or the 2007 California Air Resources Board Suggested Control Measure and the corresponding Flat, Non-flat or Non-flat-High Gloss VOC limit in CalGreen Table 5.504.4.3 shall apply.

- b. Aerosol paints and coating shall meet the PWMIR Limits for ROC in Section 94522(a)(3) and other requirements including prohibitions on use of certain toxic compounds and ozone depleting substances, in Sections 94522 (c)(2) and (d)(2) of California Code of Regulations, Title 17, commencing with Section 94520; and in areas under the jurisdiction of the Bay Area Air Quality Management District additionally comply with the percent VOC by weight of product limits of Regulation 8 Rule 49.

5. Finish Material Pollutant Control – Carpet Systems (CalGreen 5.504.4.4)

a. Requirements:

- 1) All carpet installed in the building interior shall meet the testing and product requirements of one of the following:
 - a. Carpet and Rug Institute's Green Label Plus Program
 - b. California Department of Public Health Standard Practice for the testing of VOC's (Specification 01350)
 - c. NFS/ANSI 140 at the Gold Level
 - d. Scientific Certifications Systems Sustainable Choice
- 2) All carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute Green Label program.
- 3) All carpet adhesive shall meet the requirements of Table 5.504.4.1.

6. Finish Material Pollutant Control – Composite Wood Products (CalGreen 5.504.4.5)

a. Requirements:

- 1) Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood (17CCR 93120 et. seq.), by or before the dates specified in those sections as shown in CalGreen Table 5.504.4.5.

7. Finish Material Pollutant Control – Resilient Flooring Systems (CalGreen 5.504.4.6)

a. Requirements:

- 1) For 50% of floor area receiving resilient flooring, install resilient flooring complying with the VOC-emission limits defined in the 2009 Collaborative for High Performance Schools (CHPS) criteria and listed on its Low-emitting Materials List (or product registry) or certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.

8. Filters (CalGreen 5.504.5.3)

a. Requirements:

- 1) In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a Minimum Efficiency Reporting Value (MERV) of 8.

PART 1 - **PRODUCTS**
NOT USED

PART 2 - **EXECUTION**

3.1 FIELD EXECUTION OF SUSTAINABILITY REQUIREMENTS

- A. The **General Contractor** is responsible for ensuring proper field execution of all sustainability requirements, communication with Subcontractor's of all requirements and submission of all documentation in a timely manner.
- B. Refer also to Part 1 of this Specification Section.

3.2 CONSTRUCTION VENTILATION AND PRECONDITIONING

- A. **General Contractor** shall execute the **Owner/Architect** approved Construction IAQ Management Plan.
- B. Temporary Construction Ventilation: **General Contractor** shall maintain sufficient temporary ventilation of areas where materials are being used that emit VOC's, and maintain ventilation continuously during installation, and until emissions as described below dissipate after installation. If continuous ventilation is not possible via the building's HVAC system(s) then ventilation shall be supplied via open windows and temporary fans, sufficient to provide no less than three air changes per hour.
 1. **General Contractor** shall ensure that:
 - a. Where odorous and/or high VOC emitting products are applied on-site, apply prior to installation of porous and fibrous materials. Where this is not possible, protect porous materials with polyethylene vapor retarders.
 - b. The period after installation shall be sufficient to dissipate odors and elevated concentrations of VOCs. Where no specific period is stated in these Specifications, a time period of 72 hours shall be used.
 - c. All areas shall be vented directly to outside. Areas shall not be vented to other enclosed areas.
- C. During dust producing activities (e.g. drywall installation and finishing) ventilation system shall be off, and openings in supply and return HVAC system shall be protected from dust infiltration. Provide temporary ventilation as required.
- D. Preconditioning: Prior to installation, **General Contractor** shall allow products which have odors and VOC emissions to off-gas in dry, well-ventilated space outside of building for 14 calendar days, in order to allow for reasonable dissipation of odors and emissions.

3.3 PROTECTION

- A. Protect stored on-site and installed absorptive materials from moisture damage. Where absorptive materials not intended for wet applications are exposed to moisture, immediately remove from site and dispose of properly.
- B. Protect installed materials using methods that do not support growth of molds and mildews.
- C. Immediately remove from site and properly dispose of materials showing signs of mold and signs of mildew, including materials with moisture stains.

END OF SECTION 01 81 13

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SECTION 02 41 13 – SELECTIVE SITE DEMOLITION AND PROTECTION

PART 1 - GENERAL

1.1 WORK INCLUDED THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable extents of work and dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. General:
 - a. Pay all disposal fees
 - b. Coordinate all recycling procedures and documentation
 - c. Obtain all permits
 - d. Coordinate and get approval for demolition of all existing utilities with **Owner** and appropriate utility company/governmental jurisdiction.
 - 2. Scope:
 - a. Demolition:
 - b. Removal and Disposal:
 - c. Removal and Storage for Owner use:
 - d. Removal and Storage for Future Installation:
 - e. Record Drawings / As-built information:
 - f. Protect and maintain existing vegetation designated to be saved.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. Title 24, California Code of Regulations, California Building Standards Commission
- C. CBC Energy Code, California Code of Regulations, Title 24, Part 6, California Building Standards Commission
- D. Title 24, Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- E. American National Standards Institute (ANSI), www.ansi.org
- F. American Society For Testing and Materials (ASTM), www.astm.org
- G. Industrial Accident Commission of the State of California

- H. National Demolition Association, www.demolitionassociation.com
- I. Occupational Safety and Health Administration (OSHA), United States Department of Labor, www.osha.gov
 - 1. OSHA – Regulations Standards – 29 (CFR) as approved by State of California
 - 2. OSHA – Regulations Standards – 29 (CFR), Section 1926 Occupational Safety and Health Standards for Construction as approved by State of California

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:
 - 1. Comply with manufacturer's standards.
 - 2. Comply with Building Code.
 - 3. Refer to Division 1 for additional requirements for DSA projects
- B. Sustainability:
 - 1. Refer to Division 1 sustainability requirements.
 - 2. Refer to product criteria identified herein.
- C. Refer to Division 1 for construction waste management and disposal/recycling requirements

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified
- C. Refer to Division 1 for sustainability requirements
- D. Submit a written list of all items to be submitted as indicated below and organized in a spread sheet;
 - 1. Demolition items/material
 - 2. Removed and disposed of items/materials
 - 3. Removed and stored items by **Contractor** and supplied at later date to **Owner**
 - 4. Removed and stored items to be installed at later date by **Contractor** as directed by **Owner**.
 - 5. Acknowledgment of AS-Demolished Record Drawings to include markup of drawings and pdf files named specific to each drawing sheet for all final record keeping.
 - 6. Protection and maintenance plan for existing vegetation.
- E. Submit As-built site drawings indicating the capped off locations for all utilities.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. **Contractor** shall have been in business for **five (5)** years providing demolition services for projects of similar size and complexity.
- C. **Contractor** shall be a member of the National Demolition Association in good standing.

- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Field-verify that all work by others is installed correctly prior to proceeding with demolition work under this specification and drawings.
- B. Retain and have all applicable permits obtained prior to commencing with work.
- C. Hazardous materials:
 - 1. Any known or presumed hazardous material discovered shall be brought to the **Owner's** attention immediately.
 - 2. It is the **Contractor's** responsibility to comply with the pertinent sections, as they apply to this project, of the "Construction Safety Orders" issued by the State of California last edition and all OSHA requirements.
 - 3. The **Architect**, Structural Engineer and **Owner** do not accept any responsibility for the **Contractor's** failure to comply with agency having jurisdiction, building code and/or State of California requirements.
 - 4. The **Contractor** shall be responsible for adequate design and construction of all formwork, bracing and shoring required.
- D. Safety Precautions:
 - 1. Perform demolition work in such a manner as to prevent damage to existing facilities to remain or to be salvaged and to prevent injury to public and workmen engaged on site under this or other contracts.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.
- D. Protect and maintain existing vegetation as herein specified and/or indicated in contract documents.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.

1.10 RELATED WORK / SECTIONS

- A. The following is related work including, but not limited to the following;
 - 1. New Site Work
 - 2. Coordination with Utility Companies

3. Coordination with Agencies
4. Acquisition of permits
5. Coordination with Owner
6. Surveying

B. Related Sections include, but are not limited to the following:

1. Division 1
2. Section 01 25 00 – Substitution and Deviation Procedures
3. Section 01 33 00 – Submittal Procedures
4. Section 01 50 00 – Temporary Facilities and Controls
5. Section 01 73 29 – Cutting and Patching
6. Section 01 74 00 – Protection and Cleaning
7. Section 01 74 19 – Construction Waste Management and Disposal/Recycling
8. Section 01 78 00 – Closeout Submittals
9. Section 01 81 13 – Project Sustainability Requirements
10. Section 02 41 19 – Selective Building Demolition and Protection

1.11 OPERATION AND MAINTENANCE DATA

- A. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

A. General:

1. Schedule work and sequence with **General Contractor**.
 - a. Schedule required investigation, shutoff of utilities, etc., prior to commencing with demolition, etc.
 - b. Coordinate work with **Owner's** representative including, but not limited to:
 1. Divisions 2 - 12

B. Existing Utilities:

1. Coordinate work of disconnecting & capping existing utilities including, but not limited to;
 - a. Gas
 - b. Domestic water
 - c. Fire service water
 - d. Sewer
 - e. Electrical
 - f. Cable TV
 - g. Low voltage cabling,
 - h. Etc,

C. Existing Vegetation:

1. Coordinate work of protecting and watering (maintaining) existing vegetation to remain with the following, but not limited to;
 - a. Site work, including but not limited to;
 - 1) AC Paving

- 2) Concrete curbs
 - 3) Flatwork
 - 4) Vehicular paving
 - 5) Ramps
 - 6) Underground utilities
 - b. Excavation for underground devices, piping, etc.
 - c. Erosion control
 - d. Landscape documents
 - e. Civil documents
- D. Notices:
- 1. **General Contractor** shall make the following notices to **Owner** in addition to Specifications and Division 1 including, but not limited to;
 - a. 72 hours prior to interruption of utilities.
 - b. 48 hours prior to demolishing and/or removing items/materials not specific all noted in drawings and/or specifications.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Products are acceptable to use as intended for demolition work.
- B. Refer to Division 1 for substitution, deviation and/or submittal procedures

2.2 MATERIALS

- A. As necessary by **Contractor** to complete their work and used for the purpose of demolition, etc. as herein specified and additionally as indicated in contract documents.

2.3 COORDINATION

- A. Refer to Division 1 for project coordination requirements.

2.4 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for complete and proper demolition activities, as selected by the **General Contractor** subject to the approval of the **Architect** and **Owner**.

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which demolition work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of demolition work and coordinate with **General Contractor** to rectify.

B. Hazardous materials:

1. Any known or presumed hazardous material discovered shall be brought to the **Owner's** attention immediately.

3.2 COORDINATION

- A. **General Contractor** shall coordinate demolition work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- B. Protect all existing installations from damage.
- C. Coordinate scope of work with, but not limited to; civil documents and landscape documents.
- D. Take measures to prevent damage to existing items indicated to remain during the course of work under this specification.
- E. All dimensions given to existing structure are approximate. Verify by field measurements the dimensions of the existing structure. Where actual conditions deviate from details shown on the drawings, notify the Structural Engineer for instructions before proceeding with work.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with required demolition practices.

3.4 DEMOLITION, DISPOSAL, REMOVAL, STORAGE, PROTECTION AND RECORD DRAWINGS

- A. General:
 1. Perform work in accordance with accepted demolition practices, as herein specified and in compliance with contract documents.
 2. Pay all disposal fees
 3. Coordinate all recycling procedures and documentation
 4. Coordinate and get approval for demolition of all existing utilities with **Owner** and appropriate utility company/governmental jurisdiction.
 5. Codes, regulations, agencies and jurisdictions:
 - a. Obtain all permits
 - b. Demolition work shall comply with;
 - 1) Local ordinances having jurisdiction.
 - 2) Appropriate utility company/governmental jurisdiction.
 - 3) Safety Codes of State of California.
 - 4) Rules and regulations of Industrial Accident Commission of State of California.
 6. Perform demolition work in such manner as to prevent damage to existing facilities to remain or to be salvaged, and to prevent injury to students, public and workmen engaged on site under this or other contracts.
 - a. Roofs and walls, or other building elements, shall be demolished in such manner that materials or units thereof shall fall within foundation lines of building being removed.
 - b. Demolition debris shall not be allowed to accumulate on site.
 - c. Hazardous work shall not be left standing or hanging overnight or weekends, but shall be knocked or pulled down at end of each day to avoid damage or injury to persons or existing facilities due to toppling or falling of such hazardous elements.

7. Wherever cutting and removal of portions of existing work is indicated, such work shall be sawn in manner that will produce neat and straight lines, parallel to adjacent surfaces or plumb for vertical surfaces.
 - a. Grind smooth resulting edges of concrete slabs or walks.
 - b. Neatly remove existing finish materials back to clean straight line or nearest support patches or repairs.
 - c. Execute cutting and demolition by methods which will prevent damage to other work, and which will provide proper surfaces to receive installation of repairs and new work.
 8. Any conflicting items not specifically shown (such as underground pipes, conduits, ect.) shall be brought to the attention of the Structural Engineer prior to further demolition.
- B. Demolition:
1. General:
 - a. Demolished items are to become the property of the **General Contractor** and removed from premises at **Contractor's** expense (typical, U.N.O.).
 2. Remove and dispose of all items indicated in documents, including but not limited to;
 - a. Concrete:
 - 1) Flatwork
 - 2) Curbs and gutters
 - 3) Vehicular paving
 - 4) Foundations – Refer to Section 02 41 19 – Selective Building Demolition
 - 5) Footings – Refer to Section 02 41 19 – Selective Building Demolition
 - b. Electrical:
 - 1) Wiring
 - 2) Conduit
 - 3) Light fixtures
 - c. Utilities
 - 1) Piping
 - 2) Abandoned piping
 - d. Miscellaneous
 - 1) Casework and countertops
 - 2) Plumbing fixtures
 - 3) Signage
 - 4) Items indicated in documents
 - 5) Any other items required to facilitate new construction
 - 6) Existing Pavement Marking:
 - 7) Remove rubber deposits, existing markings and other coatings adhering to pavement with scrapers, wire brushing, sandblasting, approved chemicals or mechanical abrasion.
 - a) Where oil or grease exist, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application.

- i. After cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through new paint.
- ii. Paint new markings and striping in accordance with and under Section 32 17 23 - Pavement Markings.

C. Removal and Disposal

1. All materials resulting from demolition work, except those items specifically listed or shown to be retained by **Owner** or reinstalled, shall become property of **General Contractor** and shall be removed from premises.
2. HAUL ROUTES:
 - a. Establish haul routes in advance and post flagmen to assure safety of visitors, public and workers.
 - b. Keep streets and parking areas free of mud, rubbish, debris, etc.
 - 1) **General Contractor** will assume responsibility for any damage resulting from hauling operations and hold **Owner** free and clear of any liability in connection therewith.
3. Appropriate utility company/governmental jurisdiction.
 - a. Coordinate with utility companies for and removed items that might be the property of said utility company.

D. Removal and Storage for **Owner** use:

1. Items to be retained for **Owner** shall be safely stored until said time the **Owner** requires delivery of items.

E. Removal and Storage for future Installation:

1. Items to be retained for **Owner** shall be safely stored until said time the **Owner** requires the items be installed.

F. As-Built Drawings:

1. **General Contractor** shall carefully document, photograph and provide hard copy of As-Built Drawings and Specifications of all removed items, capped off utilities and terminated utilities, conduits, etc. for as-built conditions after demolition is complete.
2. Keep record drawings in accordance with Section 01 78 00 – Closeout Submittals.

G. Protection and Maintenance of Existing Vegetation:

1. Prior to any construction or grading activities, contractor shall install vegetation & tree protection fencing, which will consist of four-foot tall plastic mesh fencing installed on six-foot poles spaced a maximum of 20 feet apart.
 - a. The poles shall be installed with two feet of length below ground and four feet above ground.
2. The fencing shall encompass an area 150% of the drip line of the tree or as appropriate where curbs, walks or drive ways are installed within drip lines.
 - a. In those cases, install fencing no more than 18" off back of curb or walk, and in no cases shall be less than 85% of the drip line of the tree being protected as approved by Landscape Architect.

- b. Tree protection fencing shall be installed and inspected by staff from the **Owner** prior to issuance of a permit.
- 3. Watering of Existing Trees
 - a. Irrigation shall be applied to all existing vegetation & trees as required to maintain good health.
 - 1) **General Contractor** will be responsible for the health of the vegetation & trees and all materials and facilities to provide adequate water. **General Contractor** shall contact the **Owner** to determine a watering schedule and any specific care required.
 - 2) **General Contractor** will be liable for the replacement of like vegetation & trees in the event of death due to neglect or lack of protection by the **General Contractor**. In the event that any of the vegetation and trees begin to suffer, contact the Landscape Architect and **Owner** immediately.

3.5 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 - 1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 - 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.
- C. Protection and maintenance of Existing Vegetation.

3.6 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so their rubbish, waste, and debris do not interfere with the work of others and are removed from project.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.

- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's** NOTICE of "Certificate of Substantial Completion".

END OF SECTION 02 41 13

SECTION 02 41 19 - SELECTIVE BUILDING DEMOLITION AND PROTECTION

PART 1 - GENERAL

1.1 WORK INCLUDED IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable extents of work and dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. General:
 - a. Pay all disposal fees
 - b. Coordinate all recycling procedures and provide appropriate documentation
 - c. Obtain all permits
 - d. Coordinate and get approval for demolition of all existing utilities with Owner and appropriate utility company/governing jurisdiction.
 - 2. Scope:
 - a. Including, but not limited to;
 - 1) Demolition.
 - 2) Concrete and saw cutting
 - 3) Removal and Disposal.
 - 4) Removal and Storage for Owner use.
 - 5) Removal and Storage for Future Installation.
 - 6) Recycling - Construction Waste Management and Recycling.
 - 7) Waste - Construction Waste Management and Recycling.
 - 8) Capping of piping as indicated in drawings.
 - 9) Patching of concrete and reinforcing
 - 10) Testing - Pressure testing of all capped piping.
 - 11) Protection of materials and surfaces to remain after demolition is complete
 - 12) Cleaning
 - a) Includes, but is not limited to;
 - i. Cleaning of interior face of glazing at Elevator and elevator enclosure
 - ii. Cleaning of interior and exterior sides of glazing at Elevator enclosure
 - 13) As-Built drawings derived from Record Drawings keep at project during demolition and construction.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.

- B. Title 24, California Code of Regulations, California Building Standards Commission
- C. CBC Energy Code, California Code of Regulations, Title 24, Part 6, California Building Standards Commission
- D. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- E. Title 24, Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- F. American National Standards Institute (ANSI), www.ansi.org
- G. American Society of Safety Engineers, www.asse.org
- H. American Society For Testing and Materials (ASTM), www.astm.org
- I. National Demolition Association, www.demolitionassociation.com
- J. Occupational Safety and Health Administration (OSHA), United States Department of Labor, www.osha.gov
 - 1. OSHA – Regulations Standards – 29 (CFR) as approved by State of California
 - 2. OSHA – Regulations Standards – 29 (CFR), Section 1926 Occupational Safety and Health Standards for Construction as approved by State of California
- K. Jurisdiction having authority (JHA)
 - 1. Within project site property lines: San Mateo County
 - 2. Street and frontage outside project site property lines: San Mateo County

1.3 PERFORMANCE, TESTING AND INSPECTION

A. **General:**

- 1. Comply with manufacturer's standards.
- 2. Comply with Building Code.

B. **Sustainability:**

- 1. Refer to Division 1 sustainability requirements.
- 2. Refer to product criteria identified herein.
- 3. Refer to Division 1 for construction waste management and disposal/recycling requirements

C. **Construction Testing:**

Item	Name of Test	Performance Results	Testing Std.
Capped piping – natural gas to remain capped	Pressure test	After capping piping, subject pipe to pressure testing and meet minimum standards.	Confirm requirements with gas company and jurisdiction having authority.

Capped plumbing – domestic water to remain capped	Water pressure test for all hot and cold water lines.	After capping piping, subject pipe to water pressure from local source and leave on for 24 hours to ensure there are not any leaks at each capped pipe location. Refit all leaking conditions and retest.	None
Capped plumbing – fire service water to remain capped	Water pressure test	After capping piping, subject pipe to pressure testing and meet minimum standards.	Fire department having jurisdiction.
Capped piping - sewer lines to remain capped	Cap	After capping sewer piping; Plug pipe discharge directly outside building at clean out or directly inside the building at closest location to exterior. Install cap at farthest location upstream from capped pipes and install cap to fit a water line to supply water pressure from local source and leave on for 24 hours to ensure there are not any leaks at each capped pipe location. Refit all leaking conditions and retest.	None
Capped line voltage and low voltage conduits to remain capped	Leak testing	Fit end of conduit with threaded type cap in material to match that of conduit.	None

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Submit a written list of all items to be as indicted below and organize in a spread sheet;
 1. Demolition items/material
 2. Removed and disposed of items/materials
 3. Removed and stored items by contractor and supplied at later date to **Owner**
 4. Removed and stored items to be installed at later date by contractor as directed by **Owner**
 5. Acknowledgment of "As-Demolished" scope for As-Built Record Drawings to include markup of drawings and pdf files named specific to each drawing sheet for all final record keeping and included in construction as-built documents.
 - a. This shall be included in as-built record drawings.

- 6. Protection and maintenance plan for existing vegetation.
- 7. Schedule of items to be tested

E. Submit shop drawings indicating the location for concrete saw cutting with extents indicated.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. **Contractor** shall have been in business for **five (5)** years providing demolition services for projects of similar size and complexity.
- C. **Contractor** shall be a member of the National Demolition Association in good standing.
- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Field-verify that all work by others is installed correctly prior to proceeding with demolition work under this specification and drawings.
- B. Retain and have all applicable permits obtained prior to commencing with work.
- C. Hazardous materials:
 - 1. Any known or presumed hazardous material discovered shall be brought to the **Owner's** attention immediately.
 - 2. Any mold or mildew discovered shall be brought to the **Owner's** attention immediately.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.
- D. Protect all materials to remain in place after demolition is complete, including, but not limited to as herein listed and indicated in drawings.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.

1.10 RELATED WORK / SECTIONS

- A. The following is related work including, but not limited to the following;
 - 1. New Site Work
 - 2. Coordination with Utility Companies
 - 3. Coordination with Agencies
 - 4. Acquisition of permits
 - 5. Coordination with Owner

6. Surveying

B. Related Sections include, but are not limited to the following:

1. Division 1
2. Section 01 25 00 – Substitution and Deviation Procedures
3. Section 01 33 00 – Submittal Procedures
4. Section 01 50 00 – Temporary Facilities and Controls
5. Section 01 73 29 – Cutting and Patching
6. Section 01 74 00 – Protection and Cleaning
7. Section 01 74 19 – Construction Waste Management and Disposal/Recycling
8. Section 01 78 00 – Closeout Submittals
9. Section 02 41 13 – Selective Site Demolition & Protection

1.11 OPERATION AND MAINTENANCE DATA

A. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

A. General:

1. Schedule work and sequence with **General Contractor**.
2. Schedule required investigation, shutoff of utilities, etc., prior to commencing with demolition, etc.
3. Coordinate with any new work to follow or occur simultaneously.
4. Coordinate work with **Owner's** representative including Existing Utilities:

B. Coordinate work of disconnecting existing capped utilities which will be connected to as part of new construction including, but not limited to;

1. Gas
2. Domestic water
3. Fire service water
4. Sewer
5. Electrical
6. Cable TV
7. Low voltage cabling,
8. Etc,

C. Coordinate work of testing existing capped utilities which will remain capped after new construction including, but not limited to;

1. Gas
2. Domestic water
3. Fire service water
4. Sewer
5. Electrical
6. Cable TV
7. Low voltage cabling,
8. Etc.

D. Coordinate removal and disposal of the following including, but not limited to;

1. Light fixtures and required wiring for new construction
- E. Coordinate reinstalling the following from demolition including, but not limited to;
 1. Light fixtures
- F. Recycling
 1. Coordinate items and/or materials which will be recycled.
 - a. Refer to Division 1 for product delivery, storage and handling requirements
 - b. Refer to drawings.
- G. Notices:
 1. **General Contractor** shall make the following notices to **Owner** in addition to Specifications and Division 1 including, but not limited to;
 - a. 72 hours prior to interruption of utilities.
 - b. 48 hours prior to demolishing and/or removing items/materials not specifically noted in drawings and/or specifications.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Products are acceptable to use as intended for demolition work.
- B. Refer to Division 1 for substitution, deviation and/or submittal procedures.

2.2 MATERIALS

- A. As necessary by contractor to complete their work and used for the purpose of demolition, etc. as herein specified and additionally as indicated in contract documents.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for complete and proper demolition activities, as selected by the **General Contractor** subject to the approval of the **Architect** and **Owner**.

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
 1. Examine areas and conditions under which demolition work is to be performed.
 2. Identify conditions detrimental to proper or timely completion of demolition work and coordinate with **General Contractor** to rectify.
- B. Hazardous materials:
 1. Any known or presumed hazardous material discovered shall be brought to the **Owner's** attention immediately.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate demolition work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- C. Protect all existing installations from damage.
- D. Coordinate scope of work with, but not limited to; civil documents and landscape documents.
- E. Take measures to prevent damage to existing items indicated to remain during the course of work under this specification.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with required demolition practices.

3.4 INSTALLATION - DEMOLITION

- A. General:
 - 1. Perform work in accordance with accepted demolition and protection practices, as herein specified and in compliance with contract documents.
 - 2. Pay all disposal fees
 - 3. Coordinate all recycling procedures and documentation
 - 4. Coordinate and get approval for demolition of all existing utilities with Owner and appropriate utility company/governmental jurisdictions having authority.
 - 5. Codes, regulations, agencies and jurisdictions:
 - a. Obtain all permits
 - b. Demolition work shall comply with;
 - 1) Local ordinances having jurisdiction.
 - 2) Appropriate utility company/governmental jurisdiction.
 - 3) Safety Codes of State of California.
 - 4) Rules and regulations of Industrial Accident Commission of State of California.
 - 6. Perform demolition and protection work in such manner as to prevent damage to existing facilities to remain or to be salvaged, and to prevent injury to public and workmen engaged on site under this or other contracts.
 - a. Roofs and walls, or other building elements, shall be demolished in such manner that materials or units thereof shall fall within foundation lines of building being removed.
 - b. Demolition debris shall not be allowed to accumulate on site.
 - c. Hazardous work shall not be left standing or hanging overnight or weekends, but shall be knocked or pulled down at end of each day to avoid damage or injury to persons or existing facilities due to toppling or falling of such hazardous elements.
 - 7. Wherever cutting and removal of portions of existing work is indicated, such work shall be sawn in manner that will produce neat and straight lines, parallel to adjacent surfaces or plumb for vertical surfaces.
 - a. Grind smooth resulting edges of concrete slabs or walks.

- b. Neatly remove existing finish materials back to clean straight line or nearest support patches or repairs.
 - c. Execute cutting and demolition by methods which will prevent damage to other work, and which will provide proper surfaces to receive installation of repairs and new work.
- B. Demolition:
- 1. General:
 - a. Demolished items are to become the property of the **General Contractor** and removed from premises at **Contractor's** expense, typical, U.N.O.
 - 2. Remove and dispose of all items indicated in documents.
 - 3. Remove and dispose of all items herein indicated including, but not limited to;
 - a. Concrete:
 - 1) Floor slabs and reinforcing
 - 2) Foundations and reinforcing
 - 3) Footings and reinforcing
 - 4) Portions of floor slabs for access to piping, etc.
 - b. Electrical:
 - 1) Wiring
 - 2) Conduit
 - 3) Light fixtures
 - 4) Switching and power devices
 - 5) J-boxes and alike items
 - c. Plumbing:
 - 1) Piping
 - 2) Plumbing fixtures
 - d. Framing:
 - 1) Wall framing
 - 2) Ceiling and soffit framing
 - e. Sheathing:
 - 1) Wall sheathing
 - 2) Ceiling sheathing
 - f. Finishes:
 - 1) Flooring and adhesive to bare substrate
 - 2) Tile and adhesive and/or thinset to bare substrate
 - g. Miscellaneous
 - 1) Vacuum Piping if not fully removed from previous work
 - 2) Accessories
 - 3) Stair Hand railings for new and remedial work, refer to drawings
 - 4) Items indicated in documents

- 5) Insulation
- 6) Any other items required to facilitate new construction

C. Removal and Disposal

- 1. All materials resulting from demolition work, except those items specifically listed or shown to be retained by **Owner** or reinstalled, shall become property of **General Contractor** and shall be removed from premises.
- 2. HAUL ROUTES:
 - a. Establish haul routes in advance and post flagmen to assure safety of visitors, public and workers.
 - b. Keep streets and parking areas free of mud, rubbish, debris, etc.
 - 1) **General Contractor** will assume responsibility for any damage resulting from hauling operations and hold **Owner** free and clear of any liability in connection therewith.
- 3. Appropriate utility company/governmental jurisdiction.
 - a. Coordinate with utility companies for and removed items that might be the property of said utility company.

D. Removal and Storage for Owner use:

- 1. Items to be retained for **Owner** shall be safely stored until said time the **Owner** requires delivery of items.

E. Removal and Storage for future Installation for Owner:

- 1. Items to be retained for Owner shall be safely stored until said time the **Owner** requires the items be installed.
- 2. Includes items as listed in drawings and also includes, but is not limited to;
 - a. Any other item coordinate with the **Owner** prior to demolition start.

F. Removal and Storage for future Installation by Contractor:

- 1. Items to be retained and safely stored until said time it is deemed appropriate to be installed.
- 2. Includes items as listed in drawings and also includes, but is not limited to;
 - a. Any other item coordinate with the **Owner** prior to demolition start.

G. Removal and Storage for future modification and/or replacement:

- 1. Items to be retained shall be safely stored until said time **Contractor** requires the items be modified replaced for installation.
- 2. Includes items as listed in drawings and also includes, but is not limited to;
 - a. IDF racks.

H. Recycling - Construction Waste Management and Recycling:

- 1. Refer to Division 1 for product delivery, storage and handling requirements
- 2. Refer to drawings.

I. Waste - Construction Waste Management and Recycling:

1. Refer to Division 1 for product delivery, storage and handling requirements
2. Refer to drawings.

J. Capping of piping:

1. Refer to drawings
2. All capping shall be done with a threaded type assembly or approved adhesive method for pipe material.

K. Testing:

1. Pressure testing of all capped piping as herein indicted and/or noted in drawings.
2. Pressure testing of existing capped utilities.
3. In compliance with agency and/or utility having jurisdiction.

L. Protection:

1. Protect materials and surfaces to remain after demolition is complete.
 - a. Repair to new condition all damaged materials.
2. Protect the following existing items/conditions and provide remedial repair as indicated in drawings and including, but not limited to;
 - a. Batt insulation:
 - 1) Keep free of contaminants such as dust, dirt and moisture/water.
 - a) If contaminated and/or damaged during demolition, then material shall be replaced in same type and thickness at a minimum of original insulation.
 - b) Any insulation found to be contaminated prior to demolition work shall be immediately brought to Owner's attention, otherwise contractor shall replace at no cost to Owner.
 - b. Fire Proofing:
 - 1) Keep free of contaminants such as dust, dirt and moisture/water.
 - a) If contaminated and/or damaged during demolition, then material shall be replaced in same type and thickness at a minimum of original insulation.
 - b) Any fire proofing found to be damaged and/or contaminated prior to demolition work shall be immediately brought to Owner's attention, otherwise contractor shall replace at no cost to Owner.
 - c. Exterior wall finishes where new infill wall framing, sheathing and finishing occurs.
 - d. Exterior wall framing where new infill framing for exterior walls will occur.
 - e. Exterior awnings
 - f. Existing break shape metal flashing/infill at existing exterior windows when existing signage is removed.
 - g. EIFS exterior wall skin system when existing signage is removed.

M. Cleaning:

1. General:

- a. Clean all remaining surfaces and materials after demolition is complete in accordance with Refer to Division 1 for protection and cleaning requirements.
- N. Cutting of concrete and metal deck:
- 1. Concrete slab on grade:
 - a. Refer to drawings and details.
 - b. Saw cut floor to remove extent of slab, but not damage existing vapor barrier.
 - 1) Replace /patch damaged vapor Barrier.
 - c. Sawn cut extent/widths shall be done as indicated and at a minimum to provide room to allow room to drill and install dowels into existing slab prior to install of new concrete.
 - d. Sawn cut extents of concrete/masonry shall be done to an extent necessary to remove piping, conduit, etc.
 - e. If water or moisture is discovered at sub base notify Architect immediately.
 - f. Schedule:
 - 1) Demolition:
 - 2) Schedule
 - a) Remove concrete only.
 - i. As herein specified
 - ii. Refer to drawings.
 - 2. Concrete slab on metal decking:
 - a. Refer to drawings and details.
 - b. Saw cut concrete to remove extent of slab, but not damage existing metal decking.
 - c. Sawn cut extent/widths shall be done as indicated and at a minimum to provide room to allow room to drill and install dowels into existing slab prior to install of new concrete.
 - d. Sawn cut extents of concrete/masonry shall be done to an extent necessary to remove piping, conduit, etc.
 - 3. Sequencing and Scheduling:
 - a. Schedule work and sequence with General Contractor
 - b. Schedule required testing, prior to the installation of materials, components, etc.
 - c. Cutting of all exposed architectural finishes shall be performed under the supervision of the General Contractor, but executed by the affected finish trade subcontractor.
 - 1) Cutting and patching of existing architectural finishes shall be minimized to the extent possible through careful routing and placement of new work. The Architect shall have the authority to reject substandard or unacceptable patching.
 - 4. Preparation:
 - a. Provide shoring, bracing and support as required to maintain structural integrity of work.
 - b. Provide protection for other portions of work.

- c. Provide protection from elements.
 - d. Each Subcontractor shall make the field measurements necessary for their work and be responsible for its accuracy.
 - e. Should any structural difficulties prevent a Subcontractor or tradesman from installing their material properly, the General Contractor shall be promptly notified so that the Architect may be consulted how best to resolve the difficulty.
 - f. Cutting into the walls and floors, if necessary, shall be carefully and neatly performed and then be repaired in an approved manner.
 - g. The Architect and Structural Engineer shall be consulted in all cases where cutting into a structural portion of the building is either desirable or necessary so that satisfactory reinforcement or other work may be provided/installed.
- O. Waste Management:
- 1. Refer to Division 1 for construction waste management and disposal/recycling requirements.
- P. As-Built drawings:
- 1. General:
 - a. Carefully document, photograph and provide hard copy of As-Built Drawings and Specifications of all removed items, capped off utilities and terminated utilities, conduits, etc. for as-built conditions after demolition is complete.
 - 1) Include As-Demolished items also
 - 2. Submit as-built drawings for demolition work including , but not limited to;
 - a. As indicated in drawings
 - b. Capped piping.
 - c. Termination locations for all conduit, piping, etc.
 - d. Items discovered which were not noted and/or indicated in demolition drawings.
 - 3. Refer to Division 1 for closeout submittal procedures.

3.5 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
- 1. General Contractor and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 - 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.6 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.

- B. Subcontractor will keep the work areas in a clean and safe condition so their rubbish, waste, and debris do not interfere with the work of others and are removed from project.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no cost to the Owner.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's** NOTICE of "Certificate of Substantial Completion".

END OF SECTION 02 41 19

SECTION 03 00 51- CONCRETE CLEANING

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the Owner's General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable extents of work and dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Field cleaning of surfaces of concrete by use of concrete cleaning compounds as herein scheduled.
 - a. New concrete surfaces
 - 1) Exterior
 - 2) Interior
 - b. Existing concrete surfaces
 - 1) Exterior

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Concrete Institute (ACI), www.aci-int.org
- E. International Concrete Repair Institute (ICRI), www.icri.org
- F. Refer to standards herein listed with specific products/materials.

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:
 - 1. Comply with manufacturer's standards.
 - 2. Comply with Building Code.
 - 3. Testing shall be done as herein specified and as listed in drawings.
- B. Standards:

1. Products shall comply with all Federal, State, and local environmental regulations.
 2. Handling and disposal of products shall be done in compliance with all Federal, State, and local environmental regulations including testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents
- C. Sustainability:
1. Refer to Division 1 sustainability requirements.
 2. Refer to product criteria identified herein.
- D. Construction Testing:
1. Cleaning Products for use on new and existing concrete substrates shall be tested prior to start of final concrete cleaning work.
 - a. Before full-scale application, review manufacturer's product data sheets to determine the suitability of each product for the specific surfaces. Apply each concrete cleaner to test surface to determine dilution rates, dwell times, number of applications, compatibility, effectiveness, application procedures, effects of pressure rinsing, and desired results.
 - b. Apply concrete cleaners to test sections in accordance with manufacturer's written instructions. Allow time frame as directed by Manufacturer and when panels are thoroughly dry before evaluating final appearance and results. Do not begin full-scale application until test panels are inspected and approved by the Architect.
 - c. Test Panel shall be 4' x 4' minimum; location and quantity of test panels shall be determined by the Architect.
 - d. Test all cleaning effluents generated by the concrete cleaning of the test panels to determine any hazardous characteristics.
 - e. Retain and protect test panels approved by the Architect in undisturbed condition during the work of this section, to be used as a standard for judging the concrete cleaning work

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.
 1. Technical information and cleaning agent label analysis with application instructions for each material proposed for use.
 - a. List each material and cross-reference to specific cleaning material for finish system and application.
 - 1) Identify by manufacturer's catalog number and general classification.
 2. MSDS for each product
 3. Submit description for application procedures of concrete cleaners.

4. Submit description for testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents.
 - a. Describe any hazardous materials to be cleaned from substrates.
 - b. Submit applicable local environmental regulations.
5. Submit qualifications of applicator.
 - a. Certification stating applicator is experienced in the application of the specified products.
6. Submit description for protecting surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non-concrete surfaces during the work from contact with concrete cleaners, residues, rinse water, fumes, wastes, and cleaning effluents.
7. Provide written description of proposed final actions to clean site and to remove materials used.
8. Submit description for surface preparation of substrates to be completed before application of concrete cleaners.
9. Schedule:
 - a. Provide a written schedule indicating locations, substrates, and work sequence of concrete cleaning, if not indicated on the drawings.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer/ Applicator shall have been in business for five (5) years providing/installing/finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for five (5) years providing/installing/finishing projects of similar size and complexity.
- D. Pre-Application Meeting: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 1. Agenda for meeting shall include, but not be limited to;
 - a. Review surfaces to be cleaned, environmental regulations, test panel procedures, protection of surrounding areas and non-concrete surfaces, surface preparation, application, field quality control, final cleaning, and coordination with other work.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Comply with Division 1 product delivery, storage and handling requirements.
- B. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- C. Store containers upright in a cool, dry, well-ventilated place, out of the sun.
 1. Store away from all other chemicals and potential sources of contamination.
 2. Keep lights, fire, sparks, and heat away from containers.
 3. Do not drop containers or slide across sharp objects.

4. Keep containers tightly closed when not in use.
5. Store and handle materials in accordance with manufacturer's written instructions.

1.7 JOB CONDITIONS

- A. Do not clean concrete surfaces when temperatures are below freezing or will be overnight, to avoid harm to concrete.
 1. Clean concrete surfaces only when air and concrete surface temperatures are 40°F and above.
 - a. Confirm with manufacturers written specifications
 2. Allow adequate time for concrete to thaw if freezing conditions exist before application.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect surrounding areas, landscaping, building occupants, pedestrians, vehicles, and non-concrete surfaces during the work from contact with concrete cleaners, residues, rinse water, fumes, wastes, and cleaning effluents in accordance with manufacturer's written instructions.
- D. Avoid wind drifting of spray of cleaning products, residues, and rinse water.
- E. Protect open joints.
- F. Clean interior concrete surfaces before installation of interior finishes, doors, hardware, metal fixtures, and all other interior non-concrete materials.
- G. Clean site of all unused cleaning products, residues, rinse water, wastes, and cleaning effluents in accordance with environmental regulations.
- H. Remove and dispose of all materials used to protect surrounding areas and non-concrete surfaces, following completion of the work of this section.
- I. Repair, restore, or replace to the satisfaction of the Architect and/or Owner, all materials, landscaping, and non-concrete surfaces damaged by exposure to the cleaning process.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish one (1) year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of Owner within the warranty period, such defects shall be repaired and replaced at no cost to the Owner.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to, the following:
 1. Topical Applied Treatments
 2. Site paving and flatwork
 3. Slab on grade concrete

4. Cast in place concrete

B. Related Sections include, but are not limited to, the following:

1. Division 1
2. Section 03 30 00 – Cast in Place Concrete
3. Section 07 92 00 – Sealants and Caulking

1.11 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with General Contractor.
- B. Schedule required testing, prior to the installation of materials, components, etc.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 1. ProSoCo, Inc., www.prosoco.com
 2. Professional Products of Kansas, Inc. www.watersealant.com
 3. US MIX Products Co. / US SPEC (303) 778-7227
 4. Reviewed Equivalent by Architect.
 - a. Substitutions and deviations shall require Architect's approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. General:
 1. Water:
 - a. Clean, potable, and free of oils, acids, alkalis, salts, and organic matter. Use to rinse concrete surfaces and dilute concentrated cleaners.
- B. Products:
 1. Cleaner and Degreaser
 - a. Mfgr: ProSoCo

- b. Product Line: Consolideck®
 - c. Product: Cleaner / Degreaser
 - 1) Low hazard / low toxicity, non-flammable and water soluble. Contains readily biodegradable ingredients. Does not contain chlorinated, fluorinated, aromatic or hydrocarbon solvents; does not contain phosphates.
 - 2) For removal of widespread oil & grease films, adhesive tape residues, rubber tire marks and scuffs, fuel & oil residues, paint and sealer residues and or daily maintenance cleaning.
 - 3) Can etch concrete. Not for use in removing embedded oil and/or grease stains.
 - d. Prepare, Dilute, Mix and Apply in compliance with manufacturer's written instructions.
2. Light Duty Concrete Cleaner
- a. Mfgr: ProSoCo
 - b. Product Line: Sure Klean®
 - c. Product: Light Duty Concrete Cleaner
 - 1) General purpose, non-etching acidic cleaner. Does not contain muriatic acid.
 - 2) For removal of common construction stains and atmospheric dirt, mortar smears, mud, efflorescence stains, localized rust and other metallic staining.
 - 3) Acidic contents may damage polished masonry, some non-masonry and acid-sensitive surfaces. May remove some surface-applied accent colors. Not for use on treated low-E glass, acrylic and polycarbonate sheet glazing, and glazing with surface applied reflective, metallic or other synthetic coatings and films.
 - d. Prepare, Dilute, Mix and Apply in compliance with manufacturer's written instructions.
3. Heavy Duty Concrete Cleaner
- a. Mfgr: ProSoCo
 - b. Product Line: Sure Klean®
 - c. Product: Light Duty Concrete Cleaner
 - 1) Concentrated general-purpose acidic cleaner. Does not contain muriatic acid. May etch concrete. Designed for use with pressure water rinsing.
 - 2) For removal of concrete splashes, excess mortar, retarders, heavy efflorescence, embedded stains, rust and surface soiling.
 - 3) Do not use on polished surfaces. Not for use on treated low-E glass, acrylic and polycarbonate sheet glazing, and glazing with surface applied reflective, metallic or other synthetic coatings and films.
 - d. Prepare, Dilute, Mix and Apply in compliance with manufacturer's written instructions.
 - e. Limitations:
 - 1) Do not use on concrete which will be left exposed, unless approved by Architect.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the General Contractor subject to the approval of the Architect.

PART 3 - **EXECUTION**

3.1 INSPECTION/EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.
 - 3. Verify by examination that concrete surfaces are acceptable to receive the specified concrete cleaners. Notify the Architect if surfaces are not acceptable to receive the specified products.
- B. Surface:
 - 1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.
- B. Coordinate application of sealants and caulking with cleaning process.
- C. Verify with substrate manufacturer the allowable & required surface preparation of each substrate prior to cleaning.
- D. Apply all specified sealants and caulking and allow to cure before cleaning process begins.
- E. Verify with substrate manufacturer the allowable & required surface preparation of each substrate prior to cleaning.

3.4 TESTING

- A. General:
 - 1. Perform tests witnessed by Owner and Architect.
 - a. Refer to procedures specified in Part 1.

3.5 INSTALLATION

- A. General:
 - 1. Dilute cleaners in accordance with manufacturers written instructions for each type of contaminant.

2. Apply concrete cleaners to substrates in accordance with manufacturer's written instructions, environmental regulations, and application procedures determined from test panel results approved by the Architect.
 3. Consult manufacturer's written instructions for information on application equipment to be used and precautions to be taken with the specified products.
- B. Schedule:
1. Exterior concrete
 - a. Flatwork
 - b. Exterior concrete pads
 - c. Concrete walls
- C. Products:
1. Cleaner / Degreaser:
 - a. Interior and Exterior Surfaces:
 - 1) Dilute Cleaner/Degreaser in accordance with Manufacturer's instructions for each intended use.
 - 2) Remove loose debris and heavy buildups.
 - 3) Apply diluted cleaning solution liberally. If spraying, do not atomize.
 - 4) Let solution dwell 1-3 minutes.
 - 5) Reapply and scrub vigorously.
 - 6) Water rinse thoroughly to remove all residues.
 2. Light Duty Concrete Cleaner:
 - a. Interior and Exterior Surfaces:
 - 1) Dilute Cleaner/Degreaser in accordance with Manufacturer's instructions for each intended use.
 - 2) Always prewet surface with fresh water. When cleaning vertical surfaces, keep lower areas wet to avoid streaks.
 - 3) Apply diluted cleaning solution directly to surface with recommended masonry brush or low-pressure spray.
 - 4) Let cleaner stay on the surface for 3-5 minutes or until stains are gone.
 - 5) Reapply cleaner and rinse thoroughly with fresh water to get all residues off the surface.
 3. Heavy Duty Concrete Cleaner:
 - a. Interior and Exterior Surfaces:
 - 1) Dilute Cleaner/Degreaser in accordance with Manufacturer's instructions for each intended use.

- 2) Working from bottom to top, prewet surface with fresh water. On vertical surfaces, keep lower areas wet to avoid streaks.
- 3) Apply diluted cleaning solution to surface with recommended masonry brush or low-pressure spray.
- 4) Let the cleaner stay on the surface 2-3 minutes or until stains are gone.
- 5) Reapply cleaner and scrub or scrape surface using wood blocks or other nonmetallic scraping devices.
- 6) Working from bottom top, rinse thoroughly with fresh water to get all residue off the surface.

3.6 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 1. General Contractor and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.
- C. Inspect the concrete cleaning work with the General Contractor, Architect, applicator, and product representative, and compare with test panel results approved by the Architect. Determine if the substrates are suitably clean.
- D. Manufacturer's Field Services: Provide the services of a manufacturer's authorized field representative to verify specified products are used, and protection, surface preparation, and application of concrete cleaners are in accordance with the manufacturer's written instructions and the test panel results approved by the Owner.

3.7 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so their rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no cost to the Owner.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.

- G. Leave entire area in a neat, clean, acceptable condition.
- H. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- I. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- J. Close out, on-site inspection will be at the discretion of the Architect after he receives the General Contractor's NOTICE of "Certificate of Substantial Completion".

END OF SECTION 03 00 51

SECTION 03 00 61 – CONCRETE FLOOR LEVELING, PATCHING AND GROUTING

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Apply 100% cementitious Concrete Floor Leveling products to level and to correct unsatisfactory conditions at concrete floors:
 - a. New concrete floors treated in accordance with Section 07 28 00 – Concrete Slab Vapor Emission Control Treatment.
 - b. New concrete not treated or not required to be treated per Section 07 28 00 – Concrete Slab Vapor Emission Control Treatment.
 - c. Existing concrete floors.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. Published specifications, standards tests and recommended methods of trades, industry or governmental organizations apply to work of this section.
- E. American Concrete Institute (ACI), www.aci-int.org
- F. American Society For Testing and Materials (ASTM), www.astm.org

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:
 - 1. Comply with manufacturer's standards.
 - 2. Comply with Building Code.
 - 3. Refer to Division 1 additional requirements for DSA projects.

1.4 SUBMITTALS

- a. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- b. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- c. Refer to Division 1 for sustainability requirements
- d. Submit Manufacturer's data and shop drawings, including data sheets, MSDS sheets and manufacturer installation instructions for each product to be used on the project.
- e. Provide Certification of compatibility of proposed floor leveling, patching and/or grouting compound(s) with applied Concrete Vapor Emission and Alkalinity Control Treatment(s).

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.
 1. Provide at least one person, present at all times during execution of this portion of the work, who is thoroughly familiar with the type of materials being installed and the best methods for their installation. They shall direct all work performed under this Section.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.
- D. Coordinate installation of these products with work performed per Section 07 28 00 – Concrete Slab Vapor Emission Control Treatment.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK / SECTIONS

- A. The following is related work including, but not limited to the following;
 - 1. Floor Substrate
 - 2. Remedial Floor Vapor and Alkalinity Control Treatment
 - 3. Finish Flooring
 - 4. All notes on the structural drawings are included in this specification.
- B. The following are related sections including, but not limited to the following:
 - 1. Division 1
 - 2. Section 03 00 51 – Concrete Cleaning
 - 3. Section 03 30 00 – Cast in Place Concrete
 - 4. Section 07 28 00 – Concrete Slab Vapor Emission and Alkalinity Control Treatment.

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. **General Contractor** shall coordinate the testing of concrete floors per Section 07 28 00 – Concrete Slab Vapor Emission Control Treatment and ensure that concrete treatment within the area of finish flooring is complete and floor vapor emission rate, PH and relative humidity tests show the slab is in compliance with each flooring manufacturer's requirements prior to the installation of finish flooring.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturer/fabricator/installer shall meet the requirements as herein specified and also as indicated in the drawings.
 - 1. Refer to documents and as herein specified.
 - 2. Reviewed Equivalent by Architect.
 - a. Substitutions and deviations shall require Architect's approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.

- c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturer's specifications/recommendations.

2.2 MATERIALS

A. Leveling Compound:

- 1. Application:
 - a. Horizontal Floor slab repair and leveling
 - b. Areas requiring leveling as approved by Architect and not deemed defective.
 - c. Installed after floor has been tested and treated for Vapor Emissions and Alkalinity per Section 07 28 00 – Concrete Slab Vapor Emission Control Treatment.
- 2. Manufacturer & Product:
 - a. L & M Const. Chemicals, Inc., www.lmcc.com
 - 1) Underlayment: LEVELEX
 - 2) Primer: Levelex Primer
 - b. U.S. Spec, www.usspec.com
 - 1) Underlayment: SLU – Self-Leveling Underlayment
 - 2) Primer: Self-leveling underlayment primer.
- 3. Material: Self leveling, Polymer Reinforced blend of Portland cements, polymers, aggregates and proprietary admixtures, contains no gypsum.
- 4. Properties:
 - a. Compressive Strength: 4,500 psi in 28 days ASTM C109
 - b. Minimum Bond Strength: 400 psi ASTM C234
 - c. Minimum Flexural Strength: 12,500 psi in 28 days ASTM C348
 - d. Flam Spread: 0 ASTM C119
 - e. Fuel Contributed: 0 ASTM C119
 - f. Smoke Density: 0 ASTM C119
- 5. Limitations:
 - a. Refer to manufacturer's product data sheets, specifications and installation instructions.
 - b. Do not use on Warehouse floors
 - c. Do not use at colored concrete areas.
 - d. Do not use at decorative concrete, including but not limited to;
 - 1) Exposed aggregate

- 2) Salt finish
 - 3) Stamped and/or pattern concrete
 - 4) Stained concrete
6. Installation: Install per manufacturer's recommendations
- B. Resurface Coating - Horizontal:
1. Application:
 - a. Resurface/repair coating to be applied over interior and exterior exposed concrete surfaces.
 - b. Installed after floor has been tested and treated for Vapor Emissions and Alkalinity per Section 07 28 00 – Concrete Slab Vapor Emission Control Treatment.
 2. Up to 1/2" maximum thickness:
 - a. Application:
 - 1) Feathered edge at non-treated floors
 - 2) 1/4" min. at floors treated per Section 07 28 00 – Concrete Slab Vapor Emission Control Treatment
 - b. Manufacturer/Product:
 - 1) US MIX Products Co., Thinpatch
 - 2) L & M Const. Chemicals, Durathin
 - c. Material:
 - 1) Polymer Modified Repair Mortar
 - d. Properties:
 - 1) Compressive Strength: Comply with ASTM C109
 - 2) Rate of Set: Comply with ASTM C266
 - 3) Bond Strength: Comply with ASTM C882
 - 4) Flexural Strength: Comply with ASTM C78
 - e. Substrates:
 - 1) Concrete flatwork
 - 2) Concrete stairs and ramps
 - 3) Exposed horizontal face of concrete site walls
 - 4) Exposed horizontal face of concrete curbs
 - 5) Concrete vehicular paving
 - f. Limitations:
 - 1) Refer to manufacturer's product data sheets, specifications and installation instructions.

- 2) Do not use for building slabs; refer to Leveling Compound heading
 - 3) Do not use on seatwalls; these conditions shall be replaced if deemed defective by Architect.
 - 4) Do not use at colored or stained concrete areas.
 - 5) Do not use at decorative concrete, including but not limited to;
 - a) Stamped and/or patterned concrete
 - b) Exposed aggregate
 - c) Salt finish
 - d) Sandblasted finish
3. Up to 3" deep patch:
- a. Application:
 - 1) Resurface/repair coating to be applied over interior and exterior exposed concrete surfaces.
 - 2) Add pea gravel per manufacturer's recommendation's for thick applications
 - b. Manufacturer/Product:
 - 1) US MIX Products Co., V/O Patch
 - 2) BASF, Master Builders, Emaco R 350 CI
 - 3) Dayton Superior, Conspec, SPECIAL PATCH
 - c. Substrates:
 - 1) Concrete flatwork
 - 2) Concrete stairs and ramps
 - 3) Exposed horizontal face of concrete site walls
 - 4) Exposed horizontal face of concrete curbs
 - 5) Concrete vehicular paving
 - d. Limitations:
 - 1) Refer to manufacturer's product data sheets, specifications and installation instructions.
 - 2) Do not use for building slabs; refer to Leveling Compound heading
 - 3) Do not use on seatwalls; these conditions shall be replaced if deemed defective by Architect.
 - 4) Do not use at colored or stained concrete areas.
 - 5) Do not use at decorative concrete, including but not limited to;
 - a) Stamped and/or patterned concrete

- b) Exposed aggregate
 - c) Salt finish
 - d) Sandblasted finish
 - e. Installation: Install per manufacturer's recommendations
- C. Patching And Resurface Coating – Vertical Surface
 - 1. Application:
 - a. Resurface/repair coating to be applied over interior and exterior exposed concrete surfaces.
 - 2. Manufacturer & Product:
 - a. Patching/resurfacing and crack/spalling filler: US SPEC, VTU Resurfacer
 - b. Resurfacer/sealer: US SPEC, Permasil
 - 3. Properties:
 - a. Compressive Strength: Comply with ASTM C109
 - b. Rate of Set: Comply with ASTM C266
 - c. Bond Strength: Comply with ASTM C882
 - d. Flexural Strength: Comply with ASTM C78
 - 4. Substrates:
 - a. Seatwalls – vertical and horizontal surfaces
 - 1) Coordinate with sandblasting
 - b. Concrete light pole bases
 - c. Exposed face of concrete foundation walls
 - d. Concrete Columns
 - e. Exposed face of concrete retaining walls
- D. Non-Shrink Grout: (Non-metallic, no chlorides, no aluminum powder)
 - 1. Application: Typical all conditions including but not limited to;
 - a. Anchor bolts, reinforcing dowels and rods
 - b. Grouting of structural and non-structural building members
 - c. Machinery bases
 - d. Precast columns
 - e. Tilt-up wall panel grouting
 - f. Coordinate with structural drawings
 - 2. Manufacturer & Product:

- a. US SPEC, Premium Grout
 - b. L & M Construction Chemicals, Inc., Crystex Grout
 - c. BASF, Master Builders Masterflow 713 or 928
3. Material: A high flow, High strength, pre-packaged compound consisting of non-metallic aggregates, cement, water reducing and plasticizing agents.
4. Properties:
- a. Compressive Strength: 13,400 psi in 28 days ASTM C109
 - b. Material: Comply with ASTM C1107
5. Installation: Install per manufacturer's recommendations

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the General Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
1. Examine areas and conditions under which work is to be performed.
 2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.
- B. Surface:
1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

- A. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- B. Inspect floor surfaces within project limits with Owner, Architect & Structural Engineer to determine unacceptable conditions, and before commencing demolition construction to repair unsatisfactory conditions in the concrete substrate.

- C. Apply concrete floor patching and leveling materials at unsatisfactory locations in accordance with manufacturer's application instructions. Finish and cure to meet product requirements and to produce a uniform substrate to receive all new work and final floor finishes.

3.5 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer / Applicator.
 - 1. General Contractor and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
- B. The Applicator shall be responsible for the proper application of the materials.
- C. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.6 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no cost to the Owner.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
- G. Leave entire area in a neat, clean, acceptable condition.
- H. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- I. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- J. Close out, on-site inspection will be at the discretion of the Architect after he receives the General Contractor's NOTICE of "Certificate of Substantial Completion".

END OF SECTION 03 00 61

SECTION 03 11 00 – CONCRETE FORMING

PART 1 - GENERAL

1.1 PRINCIPLE WORK IN THIS SECTION

- A. The requirements of the Owner's General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable extents of work and dimensions at the jobsite
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Forms for concrete, including but not limited to:
 - a. Flatwork
 - b. Curbs
 - c. Ramps
 - d. Vehicular paving
 - e. Site drainage components
 - f. Mechanical and electrical items, such as clean-outs, valve access boxes, and pads.
 - 2. Installation of bolts, anchors, sleeves, slots and inserts furnished under other Sections, except that embedded items for mechanical or electrical work are to be installed by trade involved.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Concrete Institute (ACI)
 - 1. ACI 303R Guide to Cast-In-Place Architectural Concrete Practice"
 - 2. ACI 318 Building Code Requirements For Structural Steel, Concrete and Commentary
 - 3. ACI 347 Recommended Practice for Concrete Formwork
 - 4. CBC Sections;
 - a. Typical: 1906.1 and 1906.2

- b. DSA: 1906A.1 and 1906A.
- E. Standard Grading and Dressing Rules #17, West Coast Lumber Inspection Bureau (For Douglas Fir Form Lumber).
- F. U.S. Product Standard PS 1-83 (For Plywood Form Lumber).
- G. West Coast Lumber Inspection Bureau (WCLIB)

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:
 - 1. Comply with manufacturer's standards.
 - 2. Comply with Building Code.
 - 3. Job site inspections shall be done as herein specified and as listed in drawings.
 - 4. Testing shall be done as herein specified and as listed in drawings.
 - 5. Refer to Division 1 for additional requirements for DSA projects.
- B. Sustainability:
 - 1. Refer to Division 1 sustainability requirements.
 - 2. Refer to product criteria identified herein.

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Refer to Division 1 for sustainability requirements

Submit shop drawings showing the locations of all proposed construction joints, control joints and sequence of all concrete pours (for concrete walls, columns, elevated slabs, and slab on grade, etc.)

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer shall have been in business for Five (5) years providing/installing similar size projects and complexity.
- C. Design, erect, support, brace and maintain formwork and shoring to safely support all vertical and lateral loads that might be applied until such loads can be carried by concrete.
- D. General Contractor is responsible for adequacy of all work. Specifications are only minimum standards. Adequate and safe support bracing, shoring, and stabilizing of all concrete forms is sole responsibility of General Contractor, who shall adhere to all requirements of Division of Industrial Safety, State of California.
- E. Concrete formwork shall be designated and constructed to safely support fluid concrete and superimposed construction loads without excessive deflection or concrete leakage.
 - 1. Provide bracing to maintain accurate alignment and to resist all anticipated lateral loads. Forms shall conform with drawings and to shape, line, and dimension.

2. Design, engineering and construction of forms shall be General Contractor's responsibility.
 3. Formwork for exposed concrete shall be constructed to tolerances indicated in ACI guidelines.
 - F. Cooperate and coordinate with other trades who furnish and/or install piping, conduit, reglets, anchors, inserts, sleeves, hangers, etc., as their work requires; including provisions for recesses and chases.
 - G. Conform to Standard Grading and Dressing Rules #17, West Coast Lumber Inspection Bureau (WCLIB) for Douglas Fir Form Lumber.
 - H. Conform to U.S. Product Standard PS 1-83 (For Plywood Form Lumber).
 - I. Forms shall be set and field reviewed with General Contractor prior to concrete pours to verify compliance with building code and ADA accessibility requirements.
 - J. Forms shall not be removed until concrete has reached a minimum of 80% design strength, unless approved otherwise by Structural Engineer.
- 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING
- A. Comply with Division 1 product delivery, storage and handling requirements.
- 1.7 JOB CONDITIONS
- A. Field-verify that all components, backing, subgrade, etc. by others are installed correctly to proceed with installation of products as herein specified, and indicated in drawings.
- 1.8 PROTECTION
- A. Protect finish surfaces, piping, conduit, etc. at all times from work specified herein and in drawings.
 - B. Finish work defaced with other materials on surface shall be replaced.
 - C. Protect work under this section from damage by other trades.
- 1.9 GUARANTEE / WARRANTY
- A. Refer to Division 1 for closeout submittal procedures.
- 1.10 RELATED WORK / SECTIONS
- A. Related work includes, but is not limited to the following:
 1. Rough Grading
 2. Pad construction
 3. Finish Paving
 4. Soil Treatment
 5. Reinforcing
 - B. Related Sections include, but are not limited to the following:
 1. Division 1
 2. Section 03 30 00 - Cast in Place Concrete

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers/installer/fabricator shall be one of the following and as herein listed and in Drawings:
 - 1. Refer to documents and as herein specified
 - 2. Reviewed Equivalent by Architect.
 - a. Substitutions and deviations shall require Architect's approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. Form material
 - 1. Concrete exposed to view options:
 - a. Acceptable form material:
 - 1) 5/8" minimum APA Plyform
 - 2) Steel
 - 3) MDO (medium density overplay plywood)
 - 4) Plywood
 - 2. Concrete concealed from view materials:
 - a. 5/8" minimum APA Plywood
 - b. MDO (medium density overplay plywood)
 - c. Steel
 - d. Clean and sound 1 x 8 Standard Grade Douglas Fir
- B. Fiber Forms: Tubular column forms spirally constructed of laminated plies of fiber. Plies shall be laminated using a non-water sensitive adhesive and surface wax impregnated for moisture protection. Forms shall give a smooth and seamless appearance to the cast concrete. Provide reveals, as shown on the drawings, as supplied by the form manufacturer.
 - 1. Manufactured by;

- a. Sonotube Concrete Forms (www.sonotube.com), Finish Free concrete forms
- b. Approved equal
- C. Form Clamps: Assembly to have cone washers, (1 inch break back) 3/8" center rod.
- D. Form Ties:
 - 1. Concrete exposed to view: Snap ties allowing full 1 inch break back.
 - 2. Concrete concealed from view: Snap ties or wire.
 - 3. Verify special spacing requirements with architectural drawings at exposed concrete.
- E. Spreaders: Metal (no wood permitted).
- F. Form Coating: Non-grain and non-staining types of form coating that will not leave a residual matter on the face of the concrete or adversely affect proper bonding of any subsequent paint or other surface applications.
 - 1. Form coating containing mineral oils or other non-drying materials will not be permitted for any concrete work.
 - 2. Refer to Section 03 30 00 – Cast In Place Concrete.
- G. Joint Tape: No. 471 plastic film tape 3 inches wide, as manufactured by the Industrial Tape Division of 3M Company.
- H. Expansion Joint Filler (Preformed):
 - 1. Sealtight Fibre Expansion Joint by W.R. Meadows, Inc. (www.wrmeadows.com)
- I. Extruded Polystyrene Foam: ASTM C578 type IV.
 - 1. Dow Chemical Corp. (www.dow.com) "Styrofoam".
- J. Sealant, refer to Section 07 92 00 – Sealants and Caulking.
- K. Form support bars:
 - 1. Condition where bars penetrate thru vapor barrier and cannot be patched when removed; install rigid plastic bars which are sealed with vapor barrier manufacturer's mastic when installed.
 - a. Cutoff bar close to vapor barrier prior to or during concrete placement and maintain minimum 2.5" of concrete cover.
 - b. Product, refer to Section 03 30 00 – Cast in Place Concrete

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the General Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

- A. Perform work in accordance with drawings, and as herein specified.

3.5 FIELD QUALITY CONTROL

- A. Monitor work to insure installation and assembly are in accordance with applicable standards, drawings and specifications.

3.6 WORKMANSHIP AND TOLERANCES

- A. Form to produce concrete straight, plumb and true to plan.
1. Concrete out of line, level or plumb will be rejected.
- B. Coordinate with all trades to insure proper placement of all items in forms and to provide proper blockouts wherever required.
- C. Earth Forms: Side forms for footings may be of earth provided soil will stand without caving, sides of bank are made with neat cut, and footing width is increased 2 inches, and protected from sluffing-off.
1. Comply with OSHA Standards.
 2. Comply with agencies having jurisdiction.
- D. Tolerance per ACI 347 (variance shall not be collective).
1. Variation from plumb
 - a. In the lines and surfaces of columns, piers, walls, and in risers; 1/4 per 10 ft., but not more than 1/2".
 - b. Exposed corner columns, control joint grooves, and other conspicuous lines.
 - 1) In any bay or 20' max. ----- 1/4"
 - 2) In 40' or more max. ----- 1/2"
 2. Variation of linear building lines from established position in plan and related position of columns, walls, and partitions.

- a. In any bay or 20' max. -----1/4"
- b. In 40' or more -----1/2"
- 3. Variation of sizes and locations of sleeves, floor openings, and wall openings----- 1/4"
- 4. Variation in cross-sectional dimensions of columns and beams and in thickness of slabs and walls.
 - a. Minus -----1/4"
 - b. Plus ----- 1/2"
- 5. Footings
 - a. Variation in dimensions in plan
 - 1) Minus -----1/2"
 - 2) Plus ----- 1/2"
 - b. Misplacement or eccentricity
 - 1) 2% of the footing width in the direction of misplacement but not more than ----- 2"*
 - 2) *(Applies to concrete only; not to reinforcing bars or dowels.)
 - c. Reduction in thickness
 - 1) Minus -----5%
- E. Tolerances indicated shall not be exceeded and shall not cause work to exceed accessibility requirements or limits.

3.7 CONSTRUCTION

- A. Form material: Straight, true, sound and able to withstand deformation due to loading and effects of moist curing. Do not reuse material which is warped or delaminated, and/or requires more than minor patching of contact surfaces.
- B. Build substantial forms and shores to shapes, lines, grades, elevations and dimensions indicated. Forms and shores shall be substantial, tight to prevent leakage of mortar, concrete and properly braced and tied together to maintain position and shape. Butt joints tightly and locate on solid backing. Chamfer corners where indicated. Form bevels, grooves, offsets, and recesses too neat, straight lines. Construct forms and shores for easy removal without hammering, wedging or prying against concrete. Tape plywood form joints for exposed concrete surfaces.
 - 1. No forms, shores, wooden stakes or braces shall be left in any concrete pour for either foundations or slabs beyond the point where the concrete has taken its initial set.
 - a. Steel stakes shall not be left in floor slab concrete and holes through vapor barrier shall be repaired prior to concrete placement over vapor barrier.
 - 2. All interpretations and decisions shall be made by the Architect and Inspector of Record and shall be in accordance with design unless approved otherwise by Structural Engineer.
 - 3. All forms shall extend 10" minimum below finish floor slab elevation and 10" minimum below foundation wall at exterior building sides typical.

4. All foundation trenching sides and edges shall be formed as indicated in Structural Drawings.
5. Apply form coating to forms before reinforcing steel is in place.
- C. Sleeves, anchors and bolts, including those for angle frames, supports, ties and other materials in connection with concrete construction, shall be secured in position before the concrete is placed.
- D. Proper provisions shall be made for openings, blockouts, sleeves, offsets, sinkages, recesses and depressions required by other trades and suppliers prior to placing concrete.
 1. The General Contractor shall also see that sleeves have been installed and other provisions have been made for the installation of mechanical, electrical and other equipment.
 2. Coordinate with all trades to insure proper placement of all items in forms and to provide proper blockouts wherever required.
- E. Concrete work out of alignment, level or plumb will be cause for rejection of the whole work affected and, if so rejected, such work shall be removed and replaced, as directed by Architect, with no additional cost to the Owner.
- F. Form Not Required: Concrete footings may be poured directly against cut earth where feasible and when the Structural Engineer's approval has been obtained.
 1. See structural drawings for requirements for placing concrete footings directly against earth without forms.
- G. Use $\frac{3}{4}$ inch minimum wood chamfer strips typical at all exposed corners unless noted otherwise on drawings.
- H. Space clamps, ties, hangers and other form accessories so that working capacities are not exceeded by loads imposed from concrete or concreting operations.
 1. Exposed conditions; the dimples left in concrete shall be true and align in vertical and horizontal directions.
 - a. Patch in accordance with Section 03 30 00 – Cast in Place Concrete.
- I. Brace, anchor and support all cast-in items to prevent displacement or distortion.
- J. Notify Architect, Inspector of Record and Structural Engineer 48 hours prior to concrete placement, for purpose of checking reinforcing steel placement, general form compliance, and form dimensions.
 1. This review shall in no way relieve General Contractor of his responsibility for safety of forms and shoring, or for proper dimensions.
 2. All inspections shall be made by the Inspector of Record and shall be in accordance with design unless approved otherwise.
- K. During and immediately after concrete placing, tightens forms, posts and shores. Readjust to maintain grades, levels and cambers.
- L. Slabs, walks, and curbs:
 1. Expansion joints: Install at locations indicated with backer rod and sealant.

2. Contraction joints: Install specified keyed-type joint material where indicated on Drawings, and so that maximum distance between joints is 10' - 0" for exterior concrete, unless otherwise noted on Drawings.
3. Isolation joints: Install pre-molded isolation joint material with backer rod and sealant cover between walls and slabs so that areas are isolated from all vertical features.

3.8 CLEANING OF FORMS

- A. All dirt, chips, sawdust, rubbish, water, etc. shall be completely removed from form by water hosing and air pressure before any concrete is deposited therein. No wooden ties or blocking shall be left in concrete except where indicated for attachment of other work.
- B. Thoroughly clean and patch all holes in formwork and re-coat as required before reusing. Forms not suited to obtain concrete surfaces and tolerances in conformity with Contract requirements will be rejected by Owner.
 1. Reuse of forming materials shall be limited only as required to produce the finishes as specified, free from blemishes and other defects unless covered by other building materials in which case blemish free concrete is not required.

3.9 INSPECTION OF FORMS AND VAPOR BARRIER

- A. Notify the Architect, Inspector of Record and Structural Engineer at least 48 hours in advance of the beginning of pouring operations and at the completion of formwork and location of all construction joints.
 1. An inspection of forms and joints will be made for approval of finished work and general layout only.
 2. The foregoing inspection shall in no way relieve the General Contractor of responsibility of design and safety or formwork, bulkheads and shoring.
- B. Vapor barrier shall be inspected in accordance with Section 03 30 00 – Cast in Place Concrete.
 1. All penetrations left in place shall be sealed
 2. All holes shall be patched

3.10 FORM COATING

- A. Before placement of reinforcing steel, coat faces of all forms to prevent absorption of moisture from concrete and to facilitate removal of forms. Apply specified material in conformance with manufacturer's written directions.

3.11 REMOVAL OF FORMS, SHORES, WOOD AND/OR METAL SUPPORT STAKES AND BRACES

- A. Do not remove forms until concrete has attained sufficient strength to support its weight and any construction loading. Concrete must be allowed to cure long enough to avoid damage during form removal. General Contractor or his representative in charge of concrete construction shall be present during removal of forms and shores, and shall be personally responsible for safety of this operation at all times and under all conditions.
 1. Stakes which have penetrated thru the vapor barrier when removed shall require the vapor barrier be patched at each condition, refer to Section 03 30 00 – Cast in Place Concrete

- B. Remove without damage to concrete surfaces and vapor barrier.
- C. Sequence and timing of form removal shall insure complete safety of concrete structure.
- D. Forms, shores, stakes and braces, wood and/or metal shall remain in place for not less than the following periods of time. These periods represent cumulative number of days during which temperature of air in contact with concrete is 60°F or above. For each day the temperature falls below 60°F, add additional day to periods listed that forms are to remain in place, unless otherwise directed in writing by the Owner and Structural Engineer.
 - 1. Concrete on grade: 24 hours
 - 2. Walls and Columns: 3 days

3.12 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 - 1. Remove water from all excavations.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no cost to the Owner.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide close-out documents and information in accordance with Division 1 closeout procedures.
- H. Close out, on-site inspection will be at the discretion of the Architect after they receive the General Contractor's NOTICE of "Certificate of Substantial Completion".

END OF SECTION 03 11 00

SECTION 03 20 00 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Building slabs and foundations

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Concrete Institute (ACI).
 - 1. ACI 301 - Specifications for Structural Concrete for Buildings.
 - 2. ACI 315 - Details and Detailing of Concrete Reinforcing.
- E. American Society for Testing and Materials (ASTM).
 - 1. ASTM A82 - Cold Drawn Wire for Concrete Reinforcement.
 - 2. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
 - 3. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 4. ASTM A706 - Low Alloy Steel Deformed Bars for Concrete Reinforcement.
- F. American Welding Society (AWS) - "Manual of Standard Practice".
 - 1. AWS D1.4 - Structural Welding Code Reinforcing Steel
 - 2. AWS D12.1 - Structural Welding Code Reinforcing Steel
- G. Concrete Reinforcing Steel Institute (CRSI)
 - 1. Manual of Standard Practice

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Testing shall be done as herein specified and as listed in drawings.
5. Refer to Division 1 for additional requirements for DSA Projects
6. When tests are indicated for reinforcing steel on the structural drawings, the reinforcing steel used shall be tested in accordance with ASTM A615.
 - a. One tensile and one bend test for each 2-1/2 tons of steel or fraction thereof, shall be made.
7. Tests and inspection shall be performed by Owner's testing agency except when needed to justify rejected work, in which case the cost of retests and re-inspection shall be borne by the General Contractor.
8. All reinforcing steel whose properties are not identifiable by mill test reports shall be tested in accordance with ASTM A615.
 - a. One Series of tests for each missing report shall be conducted, with cost borne by General Contractor.
9. When inspections are indicated for reinforcement placement on the Structural drawings, a special inspector shall be employed to inspect reinforcing placement per:
 - a. DSA Projects:
 - 1) CBC Chapter 17A including, but not limited to Sections; 1704A.1 , 1704A.4.2 and Tables; 1704A.3, 17804A.4, 1704A.5.1 and 1704A.5.3.
 - 2) CBC Chapter 19A, Section 1907A
10. Notify Architect and Structural Engineer 48 hours in advance of any pouring operation for inspection of reinforcing steel installation. This inspection shall in no way relieve installer of responsibility for accuracy of reinforcement placement.
11. The Owner's testing laboratory shall perform one tensile test and one bend test from a specimen taken from each 10 tons of steel (or fraction thereof) for each size of bar.
12. Welding of rebar shall be continuously inspected by a qualified welding inspector approved by Building Department. Inspections shall be performed in compliance with CBC chapter 19A.
13. Inspect shop and field welding in accordance with AWS D1.4, including checking materials, equipment, procedure and welder qualification as well as the welds. Inspector will use non-destructive testing or any other aid to visual inspection that he deems necessary to assure himself of the adequacy of the weld.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Reinforcing Steel	Shear wall foundations	Grade 60	ASTM A615

	Moment frame foundations Typical, uno.		
Reinforcing Steel	Shear wall jambs Moment frame reinforcing Vertical embeds in foundations Ties & stirrups	Grade 60	ASTM A706
Reinforcing Steel	Type	New stock	ASTM A615 & A706
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. Construction Testing:

1. Refer to Drawings
2. Refer to Specifications

1.4 SUBMITTALS

A. Refer to Division 1 for substitution, deviation and/or submittal procedures.

B. Refer to Division 1 for sustainability requirements

C. Submit shop drawings: Prepare in accordance ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars and shapes, dimensions and details of bar reinforcing and assemblies. Correctness of all reinforcing requirements and work is the responsibility of General Contractor. Identify such shop drawings with reference thereon to sheet and detail numbers from Documents.

1. Do not use scaled dimensions from Documents in determining the lengths of reinforcing bars.
2. No reinforcing steel shall be fabricated without approved shop drawings.
3. Any deviations from the contract documents must be clearly indicated as a deviation on the shop drawings.
4. Areas of high congestion, including member joints and embed locations shall be fully detailed to verify clearances and assembly parameters and coordination with other trades.

D. Certified mill test reports of supplied reinforcing indicating chemical and physical analysis. Tensile and bend tests shall be performed by the mill in accordance with ASTM A615.

E. Product Data:

1. Manufacturer's specifications and installation instructions for splice devices.
2. Bar Supports.

F. Certificates of Compliance with specified standards:

1. Reinforcing bars.

2. Welded wire fabric.
3. Welding electrodes.

G. Samples: Only as requested by Architect.

1.5 QUALITY ASSURANCE

A. Refer to Division 1 for quality control requirements.

B. General:

1. Acceptable Manufacturers: Regularly engaged in the manufacture of steel bar and welded wire fabric reinforcing.
2. Installer Qualifications: Installation shall be done only by an installation firm normally engaged in this business. All work shall be performed by qualified mechanics working under an experienced supervisor.
3. Welding Qualifications: Welding procedures, welding operators and welders shall be qualified in accordance with AWS D1.4.
 - a. Welders whose work fails to pass inspection shall be re-qualified before performing further welding.
4. Reinforcement Work shall conform to ACI 301 and CBC Section 1907A, as minimum standards.
5. Allowable Tolerances:
 - a. Fabrication:
 - 1) Sheared length: 1 inch.
 - 2) Depth of truss bars: Plus 0, minus ½-inch.
 - 3) Ties: Plus or minus ½-inch.
 - 4) All other bends: Plus or minus 1 inch.
 - b. Placement:
 - 1) Concrete cover to form surfaces: Plus or minus ¼-inch.
 - 2) Minimum spacing between bars: Plus or minus ¼-inch.
 - 3) Crosswise of members: Spaced evenly within 2 inches of stated separation.
 - 4) Lengthwise of members: Plus or minus 2 inches.
 - c. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 2 bar diameters.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.
- C. Handle and store materials to prevent contamination.

1. Store reinforcement in a manner that will prevent excessive rusting or coating with grease, oil, dirt, and other objectionable materials. Storage shall be in separate piles or racks so as to avoid confusion or loss of identification after bundles are broken.

D. Deliver and store welding electrodes in accordance with AWS D12.1.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

1.8 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.

1.9 RELATED WORK / SECTIONS

- A. Related work includes, but is not limited to the following:
 1. Concrete Placement
- B. Related Sections include, but are not limited to the following:
 1. Division 1
 2. Section 03 30 00 – Cast in Place Concrete

1.10 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 1. Complete instructions regarding operation of the equipment.
 2. Complete instructions' regarding maintenance of the equipment, materials, finishes, etc.
 3. Comply with Division 1 closeout submittal procedures.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 1. Refer to Documents, and as herein specified.
 2. Reviewed Equivalent by Architect.
 - a. Substitutions and deviations shall require Architect's approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.

D. Refer to drawings, details, and other related specification section whether listed or not.

E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. Reinforcement Bars:

1. ASTM A615, Grade 60 for No. 3 and smaller bars
2. ASTM A615, Grade 60 for No. 4 and larger bars.
3. Bar reinforcement to be welded shall meet chemical requirements of ASTM A706.

B. Stirrups and Ties:

1. ASTM A615, Grade 60 for No.4 and larger bars
2. ASTM A615, Grade 60 for No. 3 and smaller bars.

C. Steel Dowels: Same grade as bars to which dowels are connected.

D. Welded wire Fabric: ASTM A185.

E. Tie Wires: FS-QQ-W-461, annealed steel, black, 16 gauge minimum.

F. Welding Electrodes: AWS D1.4, low hydrogen, E70XX series.

G. Bar Supports:

1. Typical, unless noted otherwise; CRSI Class 2 wire supports.
 - a. Do not use wood, brick or other objectionable materials.
 - b. Do not use galvanized supports.
2. Supports placed against ground: Pre-cast concrete blocks not less than 4 inches square with embedded wire.

H. Stakes:

1. Vapor Barrier Stakes

- a. Mfg: Vaporstake, LLC, www.vaporstake.com
- b. Product: Vapor Stake
- c. Material:
 - 1) Non-corrosive, leak-resistant, plastic stake
 - 2) Made of solid PVC
- d. Lengths:
 - 1) 30"
 - 2) 36"
 - 3) 48"
- e. Design:

- 1) Acts as a permanent plug in the vapor retarder
- 2) Pre-pointed
- 3) Pre-drilled holes for 16D duplex nails

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION

- A. Examine surfaces and conditions receiving or affecting the work. The installer shall report any unsatisfactory conditions to the Architect immediately. Do not proceed until unsuitable or unsatisfactory conditions have been corrected.
- B. Proceeding with work means the installer accepts the existing conditions and substrates, and any problems related to the existing conditions or substrate shall be repaired to the satisfaction of the Architect, without additional cost to the Owner.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

- A. Prior to concrete placement, accurately place all concrete reinforcement, positively securing & supporting by concrete blocks, metal chairs or spacers. Tie with 16 gauge wire at all splices & intersections.
- B. Clearance: Provide minimum concrete covering of reinforcement as follows:
 1. Concrete below ground deposited against forms: 2 inches.
 2. Concrete deposited against earth: 3 inches.
 3. Concrete elsewhere: As indicated on drawings.
- C. Splicing: Per ACI 318 and CBC Section 1907A
 1. Horizontal bars: 40 bar diameters, 18" minimum. Unless shown otherwise on the drawing documents.
 2. Wire fabric: 12" all sides.
- D. Obstructions: Notify Architect and Structural Engineer if obstructions prevent placement of reinforcement as indicated on drawings.

3.5 GENERAL

- A. Concrete shown without reinforcing shall be reinforced as similar parts shown with reinforcing except where concrete is specifically noted to be unreinforced.

3.6 PLACEMENT

- A. All reinforcement shall be accurately set in place, lapped, spliced, spaced rigidly and securely held in place and tied with specified wire at all splices and crossing points. All wire tie ends shall point away from the form. Carefully locate all dowel steel to align with wall and column steel
 - 1. Bars shall be in long lengths with laps and splices as shown. Offset laps in adjacent bars. Place steel with clearances and cover as shown. Bar laps shall be as indicated on the Drawings. Tie all laps and intersections with the specified wire.
 - 2. Maintain clear space between parallel bars not less than 1-1/2 times nominal diameter, but in no case shall clear space be less than 1-1/2 times maximum size concrete aggregate.
 - 3. Reinforcing dowels for slabs shall be placed as detailed. Sleeves may be used if reviewed by the Structural Engineer before installation. Install dowel through all construction and expansion joints for all slabs on grade.
- B. Bar Supports:
 - 1. Support and securely fasten bars with chairs, spacers and ties to prevent displacement by construction loads or placement of concrete beyond the tolerances specified.
 - 2. Conform to CRSI as a minimum standard.
- C. Steel Adjustment:
 - 1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
 - 2. Do not move bars beyond allowable without concurrence of Structural Engineer.
 - 3. Do not heat, bend, or cut bars without concurrence of Structural Engineer.
 - 4. Reinforcement shall not be bent after being embedded in hardened concrete.
- D. Splices:
 - 1. Splice reinforcing as shown.
 - 2. Lap Splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
 - 3. Splice Devices: Install in accordance with manufacturer's written instructions. Obtain Structural Engineer's review before using.
 - 4. Do not splice bars except at locations shown without concurrence of Structural Engineer.
 - a. Where splices in addition to those indicated are required, indicate location on shop drawings clearly and highlight "for Engineer's approval."
- E. Welding:
 - 1. Welding is not permitted unless specifically detailed on Drawings or approved by Engineer.
 - 2. Employ shielding metal-arc method and meet requirements of AWS D1.4.
 - 3. Welding is not permitted on bars where the carbon equivalent is unknown or is determined to exceed 0.55.

4. Welding shall not be done within two bar diameters of any bent portion of a bar which has been bent cold.
5. Welding of crossing bars is not permitted.
- F. Welded Wire Fabric: Install in long lengths, lapping 24 inches at end splices and one mesh at side splices unless otherwise noted at drawings. Offset laps in adjacent widths. Place fabric in approximately the middle of the slab thickness unless shown otherwise on the Drawings by dimension. Wire tie lap joints at 12-inch centers. Use concrete blocks to support mesh in proper position.
- G. Reinforcement shall be free of mud, oil or other materials that may reduce bond at the time concrete is placed. Reinforcement with tightly adhered rust or mill scale will be accepted without cleaning provided that rusting has not reduced dimensions and weights below applicable standards. Remove loose rust.
- H. Protection against rust:
 1. Where there is danger of rust staining adjacent surfaces, wrap reinforcement with impervious tape or otherwise prevent rust staining.
 2. Remove protective materials and clean reinforcement as required before proceeding with concrete placements.
- I. Drawing Notes: Refer to notes on Drawings for additional reinforcement requirements.
- J. Mechanical and Electrical Drawings: Refer to Mechanical and Electrical Drawings for formed concrete requiring reinforcing steel. All such steel shall be included under the work of this Section.

3.7 CLEANING REINFORCEMENT

- A. Refer to Division 1 for protection and cleaning requirements
- B. Refer to Section 03 20 00 – Concrete Reinforcing.
- C. Before pouring concrete, clean reinforcement of rust scale, loose mill scale, oil, paint, and all other coatings which will destroy or reduce concrete-steel bond. All bolts, inserts, etc., to be cast in concrete shall be set in place prior to pouring concrete.

3.8 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no cost to the Owner.

- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
- G. Leave entire area in a neat, clean, acceptable condition.
- H. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- I. Provide record drawings in accordance with Division 1 for closeout submittal procedures.
- J. Close out, on-site inspection will be at the discretion of the Architect after they receives the General Contractor's NOTICE of "Certificate of Substantial Completion".

END OF SECTION 03 20 00

SECTION 03 30 00 - CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Cast-In-Place Concrete:
 - a. Concrete Slab-on-Grade
 - b. Concrete Footings and Foundations
 - c. Below slab Vapor Barrier & Vapor Barrier Stakes
 - d. Concrete Adhesives, Anchoring Cement, Non-Shrink Grout and Bonding Materials
 - e. Concrete Admixtures
 - f. Equipment Pads
 - g. Concrete Stairs and Ramps
 - 2. Concrete Curing
 - 3. Accessories:
 - a. Joint treatment
 - b. Form Release
 - c. Topical Sealers
 - d. Slab and Foundation Edge Insulation
 - e. High Density Rigid Foam fill
 - 4. Concrete Floor Flatness testing

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types

- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. ACI - American Concrete Institute (latest edition unless otherwise noted)
 - 1. ACI 117 Standard Specifications for Tolerances for Concrete Construction and Materials
 - 2. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavy Weight, and Mass Concrete
 - 3. ACI 301 Specifications for Structural Concrete
 - 4. ACI 302 Guide to Concrete Floor and Slab Construction
 - 5. ACI 305R Guide to Hot Weather Concreting
 - 6. ACI 306R Guide to Cold Weather Concreting
 - 7. ACI 318 Building Code Requirements for Structural Concrete and Commentary
 - 8. ACI 360 Guide to Design of Slabs-on-Grade
- E. ASTM - American Society for Testing and Materials (latest edition unless otherwise noted)
 - 1. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - 2. ASTM C33 Standard Specification for Concrete Aggregates
 - 3. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 4. ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - 5. ASTM C94 Specification for Ready-Mixed Concrete
 - 6. ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
 - 7. ASTM C143 Standard Test Method for Slump of Hydraulic-Cement Concrete
 - 8. ASTM C150 Standard Specification for Portland Cement
 - 9. ASTM C172 Standard Practice for Sampling Freshly-Mixed Concrete
 - 10. ASTM C192 Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
 - 11. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete
 - 12. ASTM C330 Standard Specification for Lightweight Aggregates for Structural Concrete.
 - 13. ASTM C494 Standard Specification for Chemical Admixtures for Concrete
 - 14. ASTM C618 Standard Specifications for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - 15. ASTM C685 Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
 - 16. ASTM C1157 Standard Performance Specification for Hydraulic Cement
 - 17. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials

18. ASTM E1155 Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers

F. Allen Face & Company, Inc. (910) 793-2877 www.allenface.com

1. The F-number & Concrete Floor Flatness/Levelness Resources

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Testing shall be done as herein specified and as listed in drawings.
5. Refer to Division 1 for additional requirements for DSA projects

B. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

C. Testing & Inspections:

1. General:

- a. Refer to Division 1 for Testing Laboratory service requirements.
- b. Cost of testing or re-testing shall be borne by **General Contractor**.

2. Structural Testing / Inspection:

- a. A testing program is required prior to start of construction. Testing program to be done in compliance with CBC Chapter 17 17A and CBC Chapter 19 19A requirements, and in collaboration with **Testing Laboratory**, **Architect**, **Structural Engineer**, **General Contractor**, and **Owner**. Testing program shall be submitted for review by the agency in charge of building enforcement. Requirements below are minimum requirements; additional requirements may be required in the final testing program.
- b. The following Concrete tests and inspections shall be made by a recognized testing laboratory selected by the **Owner** and approved by the governing agency. All tests shall be in accordance with the previously mentioned standards and ACI 318 Section 5.6. A complete record of all tests and inspections shall be kept per CBC Section 1903.1 1903A.1.

1) Batch Plant:

- a) Provide Batch Plant Inspections per ASTM C685 and CBC Section 1704 1704A.

2) Slump:

- a) Concrete consistency (slump) shall be tested in accordance with ASTM C143.

3) Compressive Strength:

- a) Perform work in accordance with ASTM C39 and CBC Chapter 19 19A.

- i. Make and cure test specimens in accordance with ASTM C31. Test in accordance with ASTM C39 and ACI 318 Section 5.6.
 - ii. A complete record shall be made of all tests and inspections, including time and locations of tests; refer to CBC and ACI 318, Section 5.6.2.
 - iii. Four identical cylinders shall be taken from each pour of 150 cubic yards or 5000 square feet or part thereof, being placed each day per ACI 318 Section 5.6.2. One cylinder shall be tested at age 7 days, and two at age 28 days unless otherwise specified. Preserve remaining cylinder for future use as directed by **Architect, Structural Engineer, and Owner.**
- c. Provide full time inspection per CBC 1704.3 1704A.3 during the taking of test specimens and during the placing of all concrete and embedded steel.
- d. Refer to drawings for reinforcing steel tests and inspections.
- 3. Concrete Slab Moisture and Alkalinity Testing:
 - a. Refer to Section 07 28 00 – Concrete Slab Vapor Emission Control Treatment for concrete slab vapor emission, PH, and relative humidity testing requirements.
- 4. Concrete Flatness and Levelness Testing:
 - a. Standards:
 - 1) ASTM E1155
 - 2) FACE Standards
 - b. Overall Flatness and Levelness Values:
 - 1) Office: FF 27 / FL 18, typical u.o.n.
 - a) Not to exceed 1/8" per 10'-0" - non cumulative measured from 10'-0" at opposite ends over a 20'-0" length such that the measurable difference at the middle is 1/8" max.
 - c. Local Flatness and Levelness Values:
 - 1) Office: FF 17 / FL 13, typical u.o.n.
 - d. Testing:
 - 1) Test floor flatness and levelness between 48 and 72 hours after concrete slab pour.
 - 2) Test floor flatness and levelness between 48 and 72 hours prior to installation of floor finish to insure values are within each flooring manufacturers requirements.
 - 3) Test in accordance with the latest edition of ASTM E1155.
 - e. Defective Concrete:
 - 1) Concrete not in compliance with the standards set forth in ACI 117 may be deemed defective.
 - 2) Defective concrete shall be remediated in accordance with PART 3 of this specification section.

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submittals:
 - 1. Concrete Mix Designs
 - a. Submit Concrete Mix Designs, stamped by a licensed Civil Engineer, for review and approval; include test data used to establish proportions.
 - 2. Certificates:
 - a. Submit Certificates of Compliance from Manufacturer for Cement, Aggregates and Admixtures.
 - 3. Product Data Sheets & MSDS Sheets:
 - a. Vapor Barrier & Vapor Stakes; include independent laboratory test results showing compliance with ASTM and ACI standards
 - b. Curing Blankets
 - c. Topical Curing Agents
 - d. Concrete Adhesives, Anchoring Cement, Non-Shrink Grout and Bonding Materials, etc.
 - e. Integral Concrete Colorant
 - f. Joint Treatment
 - g. Form Release
 - h. Topical Sealers
 - i. Hardeners
 - j. Slab Edge and Foundation Edge Insulation
 - k. High Density Rigid Foam Fill
 - 4. Manufacturer's Installation Instructions:
 - a. Vapor Barrier and Stakes
 - b. Curing method & products
 - 5. Samples:
 - a. Concrete Color samples
 - b. Grout samples for sacked surface textures and colors
 - 6. Shop Drawings:

- a. Provide joint layout plan & elevations showing all proposed construction and expansion joints for **Architect's** and **Structural Engineer's** review before construction. Highlight those items which deviate from drawings and those which are added or deleted items.
 7. Test Results:
 - a. Floor Flatness (FF) and Floor Levelness (FL)
 8. Transit Mix Delivery Slips:
 - a. Keep record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slips certifying contents of the pour.
 - b. Make the record available to the **Architect** and **Owner** for their inspection upon request.
 - c. Upon completion of this portion of the work, deliver the record and the delivery slips to the **Architect** and **Owner**.
 - E. Mock-ups:
 1. Mock-up shall be one each of the following with final specified curing, admixtures, sealers, etc.:
 - a. Slab-on-grade: 8'-0" x 8'-0"
 - 1) Mock-ups shall not be a part of final construction; after completion of building slabs, demolish and remove mock-up. Mock-up must be accepted by **Architect** prior to the start of final construction; reviewed and accepted mock-ups shall serve as standard for subsequent Work
 2. Construction:
 - a. Cast mock-ups at job site from approved materials identical to those to be used on site.
 - b. Shall include expansion, construction joints, with, hardeners, sealers, sealants, chamfers, etc. and finish as specified and detailed.
 3. **Architect** will review and accept mock-up when it is determined that the mock-up represents the design intent.
 - a. Mock-up must be accepted by **Architect** prior to the start of final construction; reviewed and accepted mock-ups shall serve as standard for subsequent Work.
- 1.5 QUALITY ASSURANCE
- A. Refer to Division 1 for quality control requirements.
 - B. Contractor shall have been in business for five (5) years providing/finishing similar size projects and complexity.
 - C. Manufacturer(s) shall have been in business for five (5) years providing/finishing similar size projects and complexity.
 - D. Stipulations:
 1. Concrete shall not be placed unless batch records are in compliance with accepted structural values.
 2. Reporting shall be completed and tracked for all testing in accordance with CBC 1704.1.1 1704A.1.1

- E. Concrete shall be installed and finished by persons regularly engaged in this type of work.
 - 1. Provide the services of a qualified and experienced superintendent who shall be hands-on and constantly be in charge of the work of this section and who shall remain at the site at all times that work is in progress. This superintendent shall direct all work performed under this Section.
 - 2. Provide persons at all times during execution of this portion of the work who are thoroughly familiar with the type of materials being installed and the best methods for their installation. All workmen shall have five (5) years of experience installing and finishing concrete and hardened Concrete.
- F. Preconstruction meeting:
 - 1. Give 7 days' NOTICE before start of any Work under this Section.
 - 2. Arrange for pre-construction meeting at the project site.
 - a. **General Contractor** and installing Subcontractor (Site superintendent and Area Superintendent) shall attend.
 - b. **Architect** and **Structural Engineer** shall be asked to attend.
 - c. **General Contractor** shall organize and record the proceedings at the meeting.
- G. **Architect** shall be notified two days prior to each concrete pour to allow review of vapor barrier installation.
 - 1. Manufacturer's Representative:
 - a. Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation of Vapor Barrier work to review installation procedures.
 - b. Manufacturer's representative shall review and certify installation of vapor barrier to verify the complete work meets specification requirements.
- H. **Architect** and **Structural Engineer** shall be notified 48 hours prior to each concrete pour to allow Structural Engineer to review concrete reinforcement.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, forms, subgrade, etc. by others are installed correctly to proceed with installation of products as herein specified.
- B. Protect finish surfaces at all times from concrete adjacent to them.
 - 1. Inspect forming against such work and establish tight leak proof seal before concrete is placed within or against the forming.
 - 2. Protect other surfaces from concrete.
 - 3. Finish work defaced with concrete on surface shall be replaced.
 - a. Concrete to be left exposed: Do not place materials on concrete, which might leave a pattern and/or imprint.

- b. Protect concrete from damage by other trades.

1.8 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.9 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to, the following:
 - 1. Grading
 - 2. Subgrade and Building Pad preparation
 - 3. Utility installation and coordination with footings and slab penetrations
 - 4. Coordinate structural concrete, pads, and supported slabs and floors with site drainage, and
 - a. mechanical, electrical and plumbing work.
- B. Related Sections include, but are not limited to, the following:
 - 1. Division 1
 - 2. Section 02 41 13 – Selective Site Demolition & Protection
 - 3. Section 02 41 19 – Selective Building Demolition & Protection
 - 4. Section 03 00 51 – Concrete Cleaning
 - 5. Section 03 00 61 – Concrete Floor Leveling, Patching and Grouting – Cementitious
 - 6. Section 03 11 00 – Concrete Forming
 - 7. Section 05 50 00 – Metal Fabrications
 - 8. Section 07 28 00 – Concrete Slab Vapor Emission and Alkalinity Control Treatment

1.10 SEQUENCING AND SCHEDULING

- A. **General Contractor** shall schedule and sequence work with related trades.
- B. Schedule required testing, prior to the installation of materials, components, etc.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 - 1. Refer to documents and as herein specified
 - 2. Reviewed Equivalent by **Architect**.

- a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
- b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS: CONCRETE

- A. Grade: Subgrade shall be graded, compacted, etc. in compliance with drawings and specifications.
- B. Gravel Base:
 1. Hard, durable, clean sand gravel, or crushed stone, free from organic material, clay balls, ASR aggregate or other deleterious substance installed over compacted grade, typical all conditions except warehouse.
- C. Aggregate Base:
 1. Hard, durable, clean Caltrans Class II aggregate base free from organic material, clay balls, asphaltic, or other deleterious materials installed over compacted grade, typical at warehouse.
- D. Portland Cement: ASTM C150, Type II. One brand of cement shall be used throughout to maintain uniform color for all exposed concrete.
- E. Aggregates: Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as combination of sizes when two or more are used, shall conform to grading requirements of appropriate ASTM Standards and building code including as herein specified.
 1. Concrete aggregates for Standard Weight Concrete shall meet ASTM C33 and be crushed granite or Perkins type.
 2. Concrete aggregates for Lightweight Concrete shall meet ASTM C330 to produce concrete weighting no more than 115 pcf at 28 days. Aggregate shall be vacuum saturated expanded shale as produced through the rotary kiln method.
- F. Water: Clean and free from injurious amounts of oil, acid, alkalis, salt, scale, organic materials and other deleterious substances; suitable for domestic consumption.
- G. Admixtures: Admixtures shall be subject to prior approval by the **Architect** and **Structural Engineer** in accordance with ACI 318 Section 3.6. Calcium Chloride is not permitted.
 1. Water Reducing:
 - a. ASTM C494: Type A for use in cool weather
 - 1) BASF Master Pozzoloth or equivalent
 - b. ASTM C494: Type D for use in hot weather

- 1) BASF Master Pozzoloth or equivalent
2. Air Entraining:
 - a. ASTM C260
 - 1) BASF Master Air or equivalent
3. Fly Ash Pozzolan:
 - a. ASTM C618 – Class F
 - b. Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete
 - c. Applicable only where allowed for use in concrete mix design; not to exceed 15% unless otherwise approved by **Architect** and **Structural Engineer**.
4. Mid-Range Water Reducing Admixtures
 - a. ASTM C494
 - 1) BASF Master Polyheed or approved equal
5. Plasticizer:
 - a. Applicable only where allowed for use in concrete mix design; not to exceed 15% unless otherwise approved by **Architect** and **Structural Engineer**.
 - b. W.R. Grace ADVA 100 or equivalent
- H. **Vapor Barrier:**
 1. Application: Typical all conditions and installed last prior to slab reinforcing and then concrete placement.
 - a. **Typical:**
 - 1) Manufacturer: STEGO Industries, www.stegoindustries.com
 - 2) Product: Stego® Wrap Vapor Barrier
 - a) Type: Extruded Plastic
 - i. Exceeds ASTM E1745 Class A, B & C requirements
 - b) Water Vapor Permeation: 0.0086 perms & 0.0036WVTR, ASTM F1249
 - c) Puncture Resistance: 2266 grams, ASTM D1709 Method B
 - d) Tensile Strength: 70.6 lbf/in, ASTM D882
 - e) Permeance after Conditioning: Complies with ASTM E1745 Sections 7.1.2 & 7.1.5, ASTM F1249, and ASTM E154 Sections 8, 11, 12 & 13
 - f) Methane Transmission Rate (GTR): 192.8GTR, ASTM D1434
 - g) Petroleum Resistance: unaffected, ASTM E154
 - h) Chemical Resistance: 149.6 GTR, ASTM E154
 - i) Life Expectancy: Indefinite, ASTM E1745

- j) Thickness: 15 mils
- k) Installation: per ASTM E1643 & Manufacturer Installation Instructions

3) Accessories:

- a) All accessories shall be provided by Vapor Barrier Manufacturer, including but not limited to: termination bars, adhesive seam tape, mastic, patching compound and pipe boots.

I. Vapor Barrier Stakes

- 1. Mfgr: Vaporstake, LLC
- 2. Product: Vapor Stake
 - a. Non-corrosive, leak-resistant PVC plastic stake which acts as a permanent plug in the vapor retarder. Stake is pre-pointed with pre-drilled holes for 16d duplex nails.
- 3. Lengths: available in 30", 36" and 48" lengths

2.3 MATERIALS: CONCRETE MIX DESIGNS

A. Type "A" Concrete:

- 1. Application: For use at footings, foundations, curbs not integral with slab-on-grade, and fire riser thrust blocks. At General Contractor's option, Type "B" concrete may be substituted for this.
- 2. Strength: 3000 psi @ 28 days
- 3. Aggregate size: 1-1/2" max.
- 4. Cement: 6.0 sacks per cubic yard min
- 5. Water/cement ratio: 0.50 max.
- 6. Slump: 3-1/2" [±1/2"]
- 7. Admixture: Water Reducing
- 8. Fly Ash: 15% maximum content as a percentage of total cementitious material
- 9. Air Entrainment: 1.5% max.

B. Type "A1" Concrete – Not Used

C. Type "B" Concrete:

- 1. Application: For use at slab-on-grade.
- 2. Strength: 3000 psi @ 28 days
- 3. Aggregate size: 1" max.
- 4. Cement: 7.0 sacks per cubic yard
- 5. Water/cement ratio: 0.42 max.
- 6. Slump: 4" maximum
- 7. Admixture: Water Reducing

- 8. Fly Ash: 15% maximum content as a percentage of total cementitious material
- 9. Air Entrainment: 1.5% max.
- D. Type "H" Concrete – Not Used
- E. For other non-structural site concrete mix designs not identified herein, refer to Division 32.
- F. Concrete mix.
 - 1. Initial mix design shall be prepared for all concrete in accordance with ACI 318 Section 5.2. Mix proportions shall be determined in accordance with ASI 318 Section 5.3 or Section 5.4. In the event that additional mix designs are required due to depletion of aggregate sources, aggregate not conforming to Specifications or at request of **General Contractor**, these mixes shall be prepared as above.
 - a. Typical: CBC Section 1905 including but not limited to; Section 1905.2, 1905.3, 1905.4 & 1905.8.
 - b. DSA: CBC Section 1905A including but not limited to; 1905A.2, 1905A.3, 1905A.4 & 1905A.8
 - 2. **General Contractor** shall notify the Testing Laboratory and **Architect** of intent to use concrete pumps to place concrete so that mix designs can be modified accordingly.
 - 3. Fly ash shall not exceed the percentages of the total cementitious material listed in the Concrete Mixes above.
 - 4. Owner's testing laboratory shall review all mix designs.
 - 5. Concrete slump shall be taken at point of placement. Use water reducing admixtures as required to provide a workable consistency for pump mixers.
 - 6. **Addition of water shall not be allowed during mixing and/or during placement of concrete.**

2.4 MATERIALS: CONCRETE CURING

A. General

- 1. Evaporation Control
 - a. Application:
 - 1) Proceed in accordance with standards to insure temperature is used in factoring in how and when slab is placed.
 - 2) Install barricades to block wind.

B. Concrete Slab-on-Grade Curing:

- 1. Wet Curing Blankets: Typical all concrete slab-on-grade
 - a. Option 1: Raven Industries ConKure80
 - 1) Type: White Reflective Wet Curing Blanket
 - 2) Standards: AASHTO M-171, ASTM C171
 - 3) Properties:

- a) Weight: 36lbs/1000ft², ASTM D751
 - b) Thickness: 21 mil, ASTM D5199
 - c) Grab Tensile Strength: 92lbf, ASTM D5034
 - d) Grab Tensile Elongation: 60%, ASTM D503
 - e) Trapezoid Tear: 36lbf, ASTM D4533
 - f) Puncture: 56lbf, ASTM D4833
 - g) Impact Resistance: 610g, ASTM D1709 (B)
 - h) Mullen Burst: 126 psi, ASTM D3786
 - i) Elmendorf Tear: 3075g, ASTM D1922
 - j) Light Reflectance: 94%, ASTM E1347 per ASTM C11-05
 - k) Water Loss (WVTR): 0.005oz/ft²/24hrs, ASTM E96 per ASTM C171-05
- b. Option 2: Reef Industries, Armorlon Transguard 2000
- 1) Type: White Reflective Wet Curing Blanket
 - 2) Standards: ASTM C171
 - 3) Properties:
 - a) Weight: 42lbs/1000ft², ASTM D2103
 - b) Thickness: 35 mil, ASTM D5199
 - c) Grab Tensile Strength: 95lbf, ASTM D4632
 - d) Grab Tensile Elongation: 50%, ASTM D4632
 - e) Trapezoid Tear: 34lbf, ASTM D4533
 - f) Puncture Strength: 65lbf, D4833
 - g) Hydraulic Burst: 190 PSI, ASTM D3786
 - h) Light Reflectance: 85%, ASTM E1347
 - i) Water Loss (WVTR): 0.0016oz/ft²/24hrs, ASTM C156
2. Wet cure as herein specified in PART 3 and per Manufacturer's recommendations.
- 2.5 MATERIALS – GROUT, ADHESIVES AND STRUCTURAL COMPONENTS
- A. Joint Filler:
- 1. Joint fill shall be a preformed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal.
- B. Non-Shrink Grout: (Non-metallic, no chlorides, no aluminum powder)

1. Application: Provide non-shrink grout conditions including, but not limited to, anchor bolts, reinforcing dowels and rods, machinery bases, precast columns, grouting of structural and non-structural building members, tilt-up wall panel grouting, and as noted on structural drawings.
 2. Manufacturer & Product:
 - a. BASF, Master Builders, MasterFlow 713 or 928
 - b. US SPEC, Premium Grout
 - c. L & M Construction Chemicals, Inc., Crystex Grout
 3. Installation: Install per manufacturer's recommendations
- C. Anchoring Cement:
1. Application: Typical all conditions as noted on structural drawings
 2. Manufacturer & Product:
 - a. BASF, Master Builders, MasterFlow 110AN
 - b. US SPEC Products Co., Anchoring Cement
 3. Limitations:
 - a. Do not apply when temperature is below 40°F, or due to fall below 40°F within 48 hours.
 - b. Do not apply over surfaces that are frozen or contain frost.
 4. Installation: Install per manufacturer's recommendations
- D. Structural Bonding Adhesive:
1. Application: Typical all conditions
 2. Manufacturer & Product:
 - a. US MIX Products Co. (303) 778-7227 Maxi-Bond 2500
 - b. L & M Const. Chemicals, Inc. EPO Bond
 3. Limitations: Per data sheet
 4. Installation: Install per manufacturer's recommendations
- E. Bonding Materials:
1. Application: Exterior
 - a. Manufacturer & Product:
 - 1) US MIX Products Co. (303) 378-2034 Acrylcoat
 - 2) L & M Const. Chemicals, Inc. L&M "EVERBOND"
 - b. Material: Acrylic latex bonding agent, non-re-emulsifiable type
 - c. Limitations: Per data sheet
 - d. Installation: Install per manufacturer's recommendations
 2. Application: Interior

- a. Manufacturer: & Product Options:
- b. US MIX Products Co. (303) 378-2034 Bond Coat
- c. L & M Const. Chemicals, Inc. L&M "EVERWELD"
- d. Material: Polyvinyl Acetate
- e. Limitations: Per data sheet
- f. Installation: Install per manufacturer's recommendations

2.6 MATERIALS – MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Form Release:

- 1. Application: Bond breaking form release for concrete forms, equipment and tools
- 2. Manufacturer: L&M Construction Chemicals, Inc.
- 3. Product: Debond Form Coating
- 4. Material: Chemical form coating consisting of highly refined fatty acids extracted from pine tree (coniferous), carried in a non-staining, non-residual petroleum hydrocarbon.
- 5. Installation: Install per manufacturer's instructions
- 6. Limitations: Do not use for Tilt-Up Concrete construction

B. Tactile Components:

- 1. Provide and coordinate installation of Detectable Warning Components per Section 32 17 26 - Tactile Warning Surfacing and drawings.

C. Topical Sealers:

- 1. Typical where Sealed Concrete is specified on floor finish plans:
 - a. Provide floor sealer per Section 09 97 23 – Concrete Sealer where noted on the drawings.

D. Leveling Compounds, Patching Mortar, and Resurface Coatings

- 1. Provide leveling compounds, patching mortars and resurface coatings per Section 03 00 61 - Concrete Floor Leveling, Patching & Grouting – Cementitious

E. Concrete Cleaners:

- 1. Provide Concrete Cleaners and perform work per Section 03 00 51 – Concrete Cleaning.

F. Vapor Emission Control Treatment:

- 1. Provide concrete slab vapor emission/alkalinity control/relative humidity treatment per Section 07 26 00 – Concrete Slab Vapor Emission Control Treatment.

G. Other Materials:

- 1. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

A. Verification of Conditions:

1. Prior to proceeding with the work, the Installer shall examine the existing conditions and substrate.
2. The Installer shall report any unsatisfactory conditions to the General Contractor and Architect immediately.
3. Do not proceed until unsuitable and/or unsatisfactory conditions have been corrected.
4. Proceeding with work means the Installer accepts the existing conditions and substrates, and any problems related to the existing conditions or substrate shall be repaired to the satisfaction of the **Architect**, without additional cost to the **Owner**.

3.2 COORDINATION

- A. Refer to Section 01 31 13 – Project Coordination.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION - GENERAL

- A. Installation shall be in accordance with Building Code and ACI standards.
- B. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- C. All interpretations and decisions shall be made by the **Architect** and **Inspector of Record** and shall be in accordance with design unless approved otherwise by **Structural Engineer**.
- D. Mock-ups must be approved prior to start of construction.

3.5 INSTALLATION - FORMWORK

- A. Concrete formwork shall be reviewed by **Structural Engineer**.
 1. Notify **Architect** and **Structural Engineer** 48 hours in advance of each concrete pour.
- B. Before placing concrete, forms shall have been erected, adequately braced, cleaned of all debris, sealed, lubricated (if required), and bulk headed where placing is to stop. Any wood forms other than plywood shall be thoroughly water soaked before placing any concrete. The wetting of forms shall be started at least 12 hours before concreting.
- C. Refer to Section 03 11 00 – Concrete Forming.

3.6 INSTALLATION - REINFORCEMENT

- A. Reinforcement shall be reviewed by **Structural Engineer**.
 1. Notify **Architect** and **Structural Engineer** 48 hours in advance of each concrete pour.
- B. Place, tie and support reinforcing steel; refer to Section 03 20 00 – Concrete Reinforcing.

- C. Clean reinforcing steel and other embedded items of mill scale and/or all coatings that would impair bond.
- D. Before placing concrete, clean areas to be occupied by concrete of all wood chips, sawdust, dirt, debris, hardened concrete and other foreign matter. No wooden ties or blocking shall be left in the concrete except where indicated for attachment of other work.

3.7 INSTALLATION - VAPOR BARRIER

- A. Apply in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- B. Level and tamp or roll granular base as specified and indicated on drawings. If sharp crushed rock is exposed after compaction, then care shall be taken to level these areas void of sharp edges prior to placement of vapor barrier/barrier.
- C. Unroll the vapor barrier running the longest direction parallel with the direction of the pour. Pull open all folds of the vapor barrier to the full width.
- D. Overlap the Vapor Barrier six inches minimum and seal with Vapor Barrier tape.
- E. Lap Vapor Barrier below concrete slab between slab and footing walls and over portions of footing surfaces (not underneath). Seal with vapor barrier manufacturer's mastic and tape.
- F. Use Vapor Barrier Stakes to support concrete forms, interior shear wall templates, plumbing pipes, and electrical sleeves.
 - 1. Avoid driving stakes through Vapor Barrier where possible; when it cannot be avoided, seal the vapor barrier to the stake as you would a pipe penetration.
 - 2. Using a power saw, cut the stake off above the seal, but below the concrete's finished surface.
 - 3. The lower portion of the stake shall remain in place, permanently plugging the penetration.
- G. All holes or openings through Vapor Barrier must be effectively sealed. Seal around pipes, support columns, conduits, pipes or any other penetration with vapor barrier manufacturer's vapor barrier patch, tape and mastic.
 - 1. Pipe & conduit penetrations shall be sealed using the following method.
 - a. Pipe & conduit penetrations (single):
 - 1) Cut a piece of vapor barrier
 - a) Width – minimum 12 inches
 - b) Length – 1-1/2 times the circumference of the pipe
 - 2) Using scissors, cut slits half the width of the film
 - 3) Wrap boot around pipe, tape onto pipe and completely tape the base to the Vapor Barrier/Retarder
 - b. Pipe & conduit penetrations (multiple penetrations):
 - 1) Cut out a small area of vapor barrier around pipes.
 - 2) Cut a patch of Vapor Barrier/Retarder extending at least 6" past the cut out in all directions.

- 3) Cut x's or small circles in the patch and install over pipes.
- 4) Overlap at least 6" and tape.
- 5) Build-up a minimum of 40 to 60 mils of mastic; completely fill all voids between the pipe and Vapor Barrier/Retarder.

H. Vapor Barrier Protection

1. When installing reinforcing steel, utilities, and during placement of concrete, take precaution to protect Vapor Barrier; provide for additional protection in high traffic areas.
2. Use only brick-type reinforcing bar supports to protect Vapor Barrier from puncture.
3. If a cushion or blotter layer is required in the design between the vapor barrier and the slab, additional care should be given if sharp crushed rock is used.
4. Care shall be taken to protect blotter layer from precipitation before concrete is placed.
5. Tears or punctures shall be repaired prior to concrete placement by cutting a patch made of the vapor barrier that overlaps the damaged area by 6" in all directions and taping around the perimeter of the patch.

3.8 INSTALLATION - MIXING OF CONCRETE

A. Equipment:

1. All concrete shall be machine mixed. Provide adequate equipment and facilities for accurate measurement and control of materials.

B. Method of Mixing:

1. Transit Mixing shall comply with ASTM C94. Ready mixed concrete shall be used throughout, except as specified below.
2. On-Site mixing shall be used only if method of storing material, mixing of material and type of mixing equipment is approved by the **Architect** and **Structural Engineer**. Approval of site mixing does not relieve **General Contractor** of any other requirements of the specifications.
3. Mixing shall be in accordance with ACI 318 Section 5.8.

C. Mixing time:

1. After mix water has been added, concrete shall be mixed not less than 1-1/2 minutes nor more than 1-1/2 hours. Concrete shall be rejected if not deposited within the time specified.
 - a. Mix until there is uniform distribution of material and mass is uniform and homogeneous; mixer must have automatic devices for measuring water and timing mixing operations; capacity of mixer one or more full sack batches; split sack batches not permitted.

D. Admixtures:

1. Air entraining and chemical admixtures shall be charged into mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighed or measured by volume as recommended by manufacturer. Accuracy of measurement of any admixture shall be within plus or minus 3%.

2. Two or more admixtures may be used in same concrete, provided such admixtures are added separately during batching sequence, and provided further that admixtures used in that combination retain full efficiency and have no deleterious effect on concrete or on properties of each other.
3. All admixtures are to be approved by **Structural Engineer**, Testing Lab and DSA prior to commencing with work.

E. Retempering:

1. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall be discarded, not retempered.
2. Indiscriminate addition of water to increase slump is prohibited.

F. Cold Weather Batching:

1. When average of the highest and lowest air temperature falls below 40°F for more than three consecutive days, provide adequate equipment for heating concrete materials. No frozen materials or materials containing ice shall be used. When placed in forms, concrete shall have a minimum temperature based on dimensions of concrete sections placed per ACI 301.

G. Hot Weather Batching:

1. Concrete deposited in hot weather shall have a placing temperature below 90°F per ACI 301. If necessary, ingredients shall be cooled to accomplish this.

3.9 INSTALLATION - PLACING OF CONCRETE

- A. Transportation: Handle from mixer to place of final deposit by methods which will prevent separation or loss of ingredients; deposit as nearly as practicable in final position in a manner which will insure that required quality is obtained. Partially hardened concrete shall not be deposited in work. Chutes shall slope not less than 4 inches and not more than 6 inches per foot of horizontal run.
- B. Conveying: Handle concrete from mixer to place of final deposit by methods which will prevent separation or loss of ingredients. Deposit concrete in forms as nearly as practicable at its final position in a manner which will insure that required quality is obtained. Chutes shall slope not less than 4 inches and not more than 6 inches per foot of horizontal run.
- C. Placing / Depositing: Deposit concrete into forms in horizontal layers not exceeding 24 inches in thickness around building, proceeding along forms at a uniform rate and consolidating into previous pour. In no case shall concrete be poured into an accumulation of water ahead of pour, nor shall concrete be flowed along forms to its final place of deposit. Fresh concrete shall not be permitted to fall from a height greater than four (4) feet without use of adjustable length pipes or, in narrow walls, of adjustable flexible hose sleeves. Concrete shall be scheduled so that placing is a continuous operation for the completion of each section between predetermined construction joints. If any concreting operation, once planned, cannot be carried on in a continuous operation, concreting shall stop at temporary bulkheads, located where resulting construction joints will least impair the strength of the structure. Location of construction joints shall be as shown on the drawings or as approved by **Structural Engineer**. The rate of rise in walls shall not be less than 2 feet per hour.

1. Consolidation: Concrete shall be thoroughly compacted and worked to all points with solid continuous contact to forms and reinforcement to eliminate air pockets and honeycombing. Power vibrators of approved type shall be used immediately following pour. Spading by hand, hammering of forms or other combination of methods will be allowed only where permitted by **Structural Engineer**. In no case shall vibrators be placed against reinforcing steel or used for extensive shifting of deposited fresh concrete. Provide and maintain standby vibrators, ready for immediate use.
 2. Hot Weather Concreting: Unless otherwise directed by the **Architect** and **Structural Engineer**, perform all work in accordance with ACI 305 when air temperature rises above 75°F and the following:
 - a. Mixing Water: Keep water temperature as low as necessary to provide for the required concrete temperature at time of placing. Ice may be required to provide for the design temperature.
 - b. Aggregate: Keep aggregate piles continuously moist by sprinkling with water.
 - c. Temperature of Concrete: The temperature of the concrete mix at the time it is being placed in the forms shall not exceed 90°F per ACI 301. The method employed to provide this temperature shall in no way alter or endanger the design mix or the design strength required.
 - d. Dampen subgrade and formwork before placing concrete. Remove all excess water before placing concrete. Keep concrete continuously wet when air temperature exceeds 85°F for a minimum of 48 hours after placing concrete.
 - e. Protection: Minimize evaporation from concrete in place by providing shade and windbreaks. Maintain such protection in place for 14 days minimum.
 - f. Ambient Air placing temperature shall not exceed as herein specified.
 3. Cold Weather Concreting: Follow recommended ACI 306 procedures when average of the highest and lowest air temperature falls below 40°F for more than three consecutive days. Concrete placed in these temperatures shall have a minimum temperature based on dimensions of concrete sections placed as shown in ACI 301. No chemicals or salts shall be used to prevent freezing and no accelerative agents shall be used without prior approval from **Architect** and **Structural Engineer**.
 4. Concrete with temperature exceeding limits herein specified at time of placement will be rejected and shall be removed from job.
- D. Screeding:
1. Install all ground floor – slab on grade concrete with Laser Screed machinery or approved equal.
 - a. Use floating form base (Floating Screed) which are integral to a flat steel plate to eliminate puncturing the vapor barrier.
 2. Install all elevated slabs by placing primary screeds at edges of pour as approved by **Structural Engineer**. Intent is to provide a flat and level surface between the primary screeds. Secondary intermediate screeds may be installed as deemed necessary by **General Contractor** and approved by **Structural Engineer** for accurate placement. All secondary intermediate screeds

shall be monitored and adjusted to accommodate structure deflection during placement to maintain flat and level surface. "Constant thickness" placement methods are not acceptable.

3.10 INSTALLATION – CONCRETE JOINTS

A. General:

1. Construction joints, including their location, shall comply with the provisions of ACI 318, Section 6.4, CBC Section 1906.4 1906A.4, and requirements provided herein.
2. Saw cut joints in slab shall be cut at earliest time when slab can be walked on.
3. Install joints before slab is cured.
4. Proposed joint layout plan shall be submitted as part of Submittal process for review prior to installation of joints.

B. Construction Joints: Install only as indicated and noted on Drawings. Joint not indicated on Drawings shall be so located, when approved, as to least impair strength of structure, and shall conform to typical details. Construction Joints shall have level tops, vertical sides. Horizontal construction joints shall be thoroughly cleaned and roughened by removing entire surface film and exposing clean aggregate solidly embedded in mortar matrix. Joints between concrete and masonry shall be considered construction joints. Vertical construction joints need not be roughened. See Drawings for doweling and required keys.

1. Roughen construction joints by any of the following methods:
 - a. By sandblasting joint.
 - b. By thoroughly washing joint, using a high pressure hose, after concrete has taken initial set. Washing shall be done no less than 3 hours nor more than 4 hours after concrete has been poured, depending upon setting time.
2. All decisions pertaining to adequacy of construction joint surfaces and to compliance with requirements pertaining to construction joints shall be reviewed with the **Structural Engineer**.
3. Just before starting new pour, horizontal and vertical joint surfaces shall be dampened, but not saturated.
4. For slabs, construction joints shall be in locations shown on plan. If not shown, locate at intervals not exceeding 150 feet in each direction. Refer to drawings for proper details for reinforcing at construction joints.

C. Expansion Joints:

1. Unless otherwise indicated, use 3/8" thick expansion joint filler.
2. Joints in interior slab-on-grade conditions shall be only in locations indicated.
3. Joints in exterior slab-on-grade shall be installed at each side of structures, at curb transitions opposite apron joints, at ends of curb returns, at back of curb when adjacent to sidewalk, and at uniformly spaced intervals not exceeding 20 feet.
4. Edges of concrete at joints shall be edger finished to approximately 3/8" radius.
5. Interrupt reinforcing at all expansion joints.

D. Control Jointing - Concrete Slab-on-Grade:

1. Joints shall be in locations indicated on Drawings, or as directed by **Architect**.
2. Joints in interior slabs shall be made by one of the following methods:
 - a. By use of construction joints laid out in checkerboard pattern; pour and allow alternate slabs to set; fill out balance of checkerboard pattern with second pour.
 - b. By use of dummy groove joints at least 1/4 the depth of slab, and at least 1/8" wide. These joints may be sawcut as soon as wet concrete can support the weight of the equipment and operator. Delaying sawcutting past this point will make jointing ineffective.
3. Control jointing in exterior paving slabs shall be laid out in a checkerboard pattern; pour as described above but with joint edges tooled to provide a uniform joint at least 3/8" in depth.
4. Slab reinforcing need not be terminated at control joints
5. Construction and expansion joints shall be counted as control joints.

- E. Score markings on exterior slabs on grade shall be located as indicated. Where not indicated, mark slabs into rectangles of not less than 12 square feet nor more than 20 square feet using a scoring tool which will leave edges of score markings rounded.

3.11 CONCRETE CURING

A. Wet Curing Blankets:

1. Wet cure in accordance with wet curing blanket manufacturer's instructions and as noted below:
 - a. Pre-wet concrete as required, taking care to prevent erosion of the surface.
 - b. Apply wet curing blankets as soon as possible after placing & finishing the concrete without marring the surface. Unroll wet curing blankets with the white-coated side up and the gray side toward the concrete surface.
 - c. Fold back approximately 1/2 of the blanket and spray gray side with water. Unfold the moist side back to the surface of the concrete and repeat this process with the other side.
 - d. Overlap panels approximately 12" and weight down edges to avoid wind damage and to seal in moisture.
 - e. Concrete forms should also be covered and kept wet during the curing process.
 - f. Keep blankets in contact with the entire concrete surface at all times during the curing process.
 - g. Re-wetting will likely be required during the curing process depending upon weather conditions.
 - h. Care should be taken so the concrete is not stained by impurities in the water or by soiled blankets.
 - i. Wet cure in accordance with schedule below, but not for less than seven (7) days:

Cure Time (days)	Water / Cement Ratio:
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7	Up to 0.48
21	0.49 or more

3.12 INSTALLATION - CONCRETE FINISHING AND PATCHING

- A. Immediately after removal of forms and after concrete surfaces have been inspected:
1. Remove fins and rough spots
 2. Remove forming ties.
 3. Honeycombed areas shall be removed down to sound concrete, coated with a bonding grout or approved compound and patched using a low shrinkage high bond mortar.
 4. Fill damaged and irregular surfaces, holes left by form clamps and tie wires, and sleeves with "Patching Mortar". Match texture of exposed adjacent concrete surface.
 5. Patching not allowed on colored concrete.
 6. Patching not allowed where structural strength is affected.
 7. Patching of concrete is subject to approval by **Structural Engineer** and DSA.
- B. Leveling: Floor leveling materials shall be applied as required to meet tolerance; gypsum base products are not allowed
- C. Joints: Mark off exposed joints, where indicated, with 1/4 inch radius edging tool. Markings to be clean cut, straight, and square with respect to border. Tool edges of exposed expansion and contraction joints, border edges, and wherever concrete adjoins other material or vertical surfaces.
- D. Sack Surfaces: Exposed surfaces that are unacceptable in appearance to the **Architect** shall be sacked upon **Architect's** approval.
1. Prepare concrete surfaces in accordance with the referenced standards. Remove any form release materials by stoning by hand, power grinding or other method approved by the **Architect**.
 2. Prepare concrete surfaces to receive sack finishing with a light sand blasting.
 3. Prepare grout samples for matching of concrete surfaces for approval by the **Architect**. These shall be made in the following proportions of gray cement to white cement to sand: 1:1:2, 1:2:3, and 2:1:3, etc. until the correct matching color is obtained on the test areas. Sand should be fine enough to pass the Number 30 sieve. Mixes should be made to a good workable consistency in a clean container. Provide sufficient quantities of sand and cement from the same source for the complete work at the job site.
 4. Mixing and Application:
 - a. Time mixing of grout on the job such that it will be used within 1 to 1-1/2 hours.
 - b. Let the grout stand 20 to 30 minutes after mixing, and then re-mix before applying.
 - c. Soak the concrete surface thoroughly with water at least 15 minutes before applying grout and again just before application so that the surface is adequately wet during the operation.
 - d. Apply grout with plasterer's trowel or sponge rubber float in sweeping strokes from the bottom up. Brush or spray gun applications may be used when approved by the **Architect**.

- e. Work in freshly applied grout vigorously with a sponge rubber float, then let sit until some of its plasticity is gone but not until it loses its damp appearance. At this point it shall be rubbed with clean, dry burlap to remove the excess grout, leaving no visible film on the surface but filling all air holes.
 - f. Keep the surface wet for a day after grouting and sack rubbing are completed.
- 5. Alternate methods of application and materials shall be subject to the approval of the **Architect**.
- E. Interior Slab-on-Grade, typical u.o.n. - Smooth finish
 - 1. Tamp slab surface with grid tamper and strike off to firm screeds; following stiffening of concrete, float to true surface and finish as follows:
 - a. Two steel troweling operations; long-handled or Fresno trowel not permitted; first troweling performed when concrete will support operator on kneeboards; second troweling to follow concrete initial set for "non-burnished" or single-troweled for any concrete to receive floor coverings and surface free from trowel marks, depressions, ridges or other blemishes, and shall be acceptable to finish flooring applicators.
 - b. Do not darken slab surface with over troweling or burnishing.
 - c. Install Sealers and penetrants after concrete has cured.
 - d. Where slab is not exposed or where appearance is not important, cracks larger than 1/32" wide shall be filled with cement grout and struck off level with surface.
 - e. Where slab is exposed and appearance is important, unsightly cracks shall be repaired in a manner satisfactory in appearance to Architect. If this cannot be accomplished, concrete shall be considered defective.
 - f. Patching not allowed on colored concrete.
 - g. Patching not allowed where structural strength is affected.
 - h. Patching of concrete is subject to approval by **Structural Engineer** and DSA.
- F. Rough formed finish:
 - 1. Applies at vertical concrete surfaces not exposed to view such as back of walls, fountain structures, and other areas to receive applied finishes or waterproofing.
 - 2. Shall have no surface finish imparted by overlay plywood or any other formwork.
 - 3. Surfaces shall be reasonably true to line and plane.
 - 4. Fins and other rough spots at surfaces to receive applied finishes or membrane waterproofing shall be completely removed and the surfaces rubbed smooth, otherwise, surfaces shall be left with the texture imparted by forms.
 - 5. Tie holes and defects shall be patched prior to final finishing.
- G. Smooth Plywood Form Finish:
 - 1. Applies to exposed foundations, typical, u.o.n.
 - 2. Finish shall be true to line and plane

3. Arrangement of plywood sheets shall be orderly, symmetrical, as large as practical and free of torn grain or worn edges.
4. Fins and other rough spots at surfaces to receive applied finishes or membrane waterproofing shall be completely removed and the surfaces rubbed smooth, otherwise, surfaces shall be left with the texture imparted by forms.
5. Tie holes and defects shall be patched prior to final finishing.
6. Surface concrete shall be treated with 1 part muriatic acid, in three parts water solution, followed immediately by a thorough rinsing with clear water.
7. Surfaces which are glazed, have efflorescence, or traces of form oil, curing compounds or parting compounds shall be cleaned or treated to match other formed surfaces, except as otherwise indicated or specified.

H. Smooth Formed with **Very Light** Sandblasted Finish:

1. Applies at exposed vertical and horizontal surfaces of seat walls, retaining walls, concrete light standards, exterior stair and exterior ramp curbs, etc.
2. Finish shall be true to line and plane.
3. Shall have no surface finish imparted by overlay plywood or any other form framing.
4. Fins and other rough spots at surfaces to receive applied finishes or membrane waterproofing shall be completely removed and the surfaces rubbed smooth, otherwise, surfaces shall be left with the texture imparted by forms.
5. Patch defects prior to final finishing.
6. Tie holes and defects shall be patched prior to final finishing.
7. Texture shall match other sandblasted finishes.
8. Magnesium float or steel trowel exposed top of walls prior to sandblasting.

I. Smooth Formed with **Very Light** Broom Finish:

1. Applies to vehicular paving (roadways, trash enclosure pad/paving, etc.), exterior stairs and exterior ramp walking surfaces.
2. Shall have no surface finish imparted by overlay plywood or any other form framing.
3. Fins and other rough spots at surfaces to receive applied finishes or membrane waterproofing shall be completely removed and the surfaces rubbed smooth, otherwise, surfaces shall be left with the texture imparted by forms.
4. Patch defects prior to final finishing.
5. Texture to create slip resistant surface.
6. Magnesium float or steel trowel prior to Broom finishing.
 - a. Clean brooms shall be used for final finishing.
 - 1) The broom shall be at least 3 feet wide and long enough to transverse between key joints, control joints or expansion joints.

- 2) A stiff bristled broom shall be drawn from the opposite edge of the pavement, to the adjacent edge & producing face corrugations of uniform appearance and a 1/16-inch in depth max.

b. Apply concrete paving topical applied sealer/protective coating where specified.

3.13 DEFECTIVE CONCRETE

A. As directed by **Architect** & **Structural Engineer** and at no cost to **Owner**, remove defective concrete from site.

1. No patching is to be done until surfaces have been examined by **Architect** & **Structural Engineer**.

B. Defective concrete is defined as follows:

1. Concrete not meeting 100 percent of the specified 28 day compressive strength.
2. Concrete exhibiting rock pockets, voids, spalls, cracks, exposed reinforcing, sand pockets or other such defects, which adversely affect strength, durability or appearance.
3. Concrete which is incorrectly formed, out of alignment or not plumb or level.
4. Concrete not containing required embedded items.
5. Concrete containing embedded wood or debris.
6. Concrete having patched voids, which were not filled under **Architect's** direction.
7. Concrete with the improper surface finish from that specified and/or indicated on the Drawings.
8. Concrete with exposed steel reinforcing at the finish exposed surfaces.
9. Concrete not meeting floor flatness and level required as herein specified and as required by each flooring manufacturer for each specific flooring location at time when floor finish is being installed.

C. Upon determination that concrete strength is defective:

1. Should cylinder tests fall below minimum strength specified, concrete mix for remainder of work shall be adjusted to produce required strength. Core samples shall be taken and tested from cast-in-place concrete where cylinders and samples indicate inferior concrete with less than minimum specified strength.
 - a. Cores of hardened concrete shall be taken and tested in accordance with ASTM Standards including ASTM C39 and ASTM C42 and additionally CBC Section 1905.6 1905A.6.
 - 1) Number and location of such cores shall be subject to the approval of **Architect** and **Inspector of Record**.
 - b. Cost of core sampling and testing will be paid for by the **General Contractor**.
 - c. "85 percent" reduction in ACI 318 Section 5.6.5.4 will not justify low cylinder tests.

D. Upon determining that concrete surface is defective, **General Contractor** may restore concrete to acceptable condition by cutting, chipping, pointing, patching, grinding, if this can be done without significantly altering strength of structure. Permission to patch defective areas will not be

considered a waiver of the right to require removal if patching does not, in the opinion of the **Architect**, satisfactorily restore quality and appearance.

1. Total replacement required if concrete is dyed or stained.
 2. No repair work shall begin until procedure has been reviewed by the **Architect** and **Structural Engineer** and **Inspector of Record**.
 3. Patching must be approved by **Architect** and **Structural Engineer** and **Inspector of Record**.
- E. If core tests indicate that concrete is below the strength specified, or if patching does not restore concrete to specified quality and appearance, the concrete shall be deemed defective, and shall be removed and replaced without additional cost to the **Owner**.

3.14 PROTECTION AND CLEAN UP (TYPICAL)

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so their rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out on-site inspection will be at the discretion of the **Architect** after they receive the **General Contractor's** request for Substantial Completion and receipt of the **General Contractor's** punch list.

END OF SECTION 03 30 00

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the job site.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Shop fabricated metal items and miscellaneous metal work, refer to as herein scheduled.
 - 2. Painting finish

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society for Testing and Materials (ASTM)
 - 1. ASTM A36 – Specifications for Structural Steel
 - 2. ASTM A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded And Seamless
 - 3. ASTM A120 – Welded Steel Pipes, Galvanized Threaded and Coupled
 - 4. ASTM A123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 5. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 6. ASTM A307 – Standard specification for carbon steel bolts and studs, 60 ksi tensile strength
 - 7. ASTM A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 - 8. ASTM A513 – Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
 - 9. ASTM A569 – Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
 - 10. ASTM A615 – Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

- 11. ASTM A653 – Hot Dip Galvanized Coils & Sheets - quality norms
- 12. ASTM A780 – Specification for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings
- 13. ASTM E303 - Method of Measuring Surface Frictional Properties Using the British Pendulum Tester

E. American Institute of Steel Construction (AISC)

- 1. AISC - ASD Manual of Steel Construction
- 2. AISC - Manual of Steel Construction

F. American Welding Society (AWS)

- 1. AWS - D1.1 Structural Welding Code - Steel
- 2. AWS - D1.3 Structural Welding Code - Sheet Steel
- 3. Welding Procedure and Performance Qualification

G. National Ornamental and Miscellaneous Metals Association (NOMMA)

- 1. NOMMA - Guideline 1 - Joint Finishes

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

- 1. Comply with manufacturer's standards.
- 2. Comply with Building Code.
- 3. Job site inspections shall be done as herein specified and as listed in drawings.
- 4. Testing shall be done as herein specified and as listed in drawings.
- 5. Refer to Division 1 for additional requirements for DSA projects

B. Sustainability:

- 1. Refer to Division 1 sustainability requirements.
- 2. Refer to product criteria identified herein.

1.4 SUBMITTALS

A. Refer to Division 1 for substitution, deviation and/or submittal procedures.

B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.

C. Refer to Division 1 for sustainability requirements

D. Submit Manufacturer's data and shop drawings.

- 1. Submit complete shop drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories for all fabricated items included hereunder. Include erection drawings, elevations and details where applicable. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.
- 2. Descriptive data: Submit complete data for manufactured items.

1.5 QUALITY ASSURANCE

A. Refer to Division 1 for quality control requirements.

- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.
- D. Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 - 1. Agenda for meeting shall include, but not be limited to;
 - a. Coordination with associated construction

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Deliver all parts ready for erection; store in close proximity to final locations.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish one (1) year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to, the following:
 - 1. Ceiling Construction
 - 2. Cast-in-Place Concrete
 - 3. Concrete Paving and Flatwork
- B. Related Sections include, but are not limited to, the following:
 - 1. Division 1
 - 2. Section 02 41 13 – Selective Site Demolition & Protection
 - 3. Section 03 30 00 – Cast in Place Concrete
 - 4. Section 07 62 00 – Sheet Metal Flashing & Trim
 - 5. Section 09 90 00 – Paintings and Coatings

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding operation of any operable equipment or assemblies.
 - 2. Complete instructions regarding maintenance of the equipment, materials, and finishes, etc.
 - 3. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturer and fabricator shall be one of the following and as herein listed and in Drawings:
 - 1. Refer to documents and as herein specified.
 - 2. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. General:
 - 1. Steel sections: ASTM A36, unless otherwise noted on drawings.
 - 2. Galvanizing: Hot-dip process ASTM A123 typical and ASTM A153 for threaded fasteners performed after fabrication into largest practical section. Weight of coating not less than 2 oz. per sq. ft. of surface. Where damaged, repair surface with one coat of hot process galvanizing repair compound, "Galvalloy", "Galvweldalloy", or approved equal.
 - 3. Hot-dipped, zinc-coating on assembled steel products: ASTM A653, galvanized in accordance with G90 coating designation.
 - 4. Steel pipe: ASTM A53 or ASTM A120, size per drawings, hydrostatic tests not required; or standard ASTM A36 steel pipe, size per drawings.
 - 5. Steel bolts, nuts, and washers: ASTM A307

- 6. Welding materials: AWS D1.1, type required for materials being welded
- 7. Primer: Comply with Section 09 90 00 – Paintings & Coatings
- 8. Painted finish: Comply with Section 09 90 00 – Paintings & Coatings

B. Schedule:

1. General:

- a. The following Schedule lists principal items only; refer to drawings for items not specifically scheduled herein.
 - 1) Provide, design, provide shop drawings and install items listed in Schedule and shown on Construction Drawings with anchorage and attachments necessary for installation.
 - 2) Provide Steel support angles and channels not included in other section.
 - 3) Provide Steel angle edge protection not included in other section.
 - 4) Provide corner, ledge and shelf angles, channels and plates not attached to structural steel; complete with anchorage for embedment in concrete where required. Hot dip galvanized items embedded in concrete or masonry.

2. Gates – Trash / Equipment Enclosure Gates:

- a. Steel gates and jambs: Steel tube, angles, channel, ribbed decking, and/or plate stock as shown in drawings, all welded construction. Weld on steel hinges capable of supporting weight of gate when completely assembled as shown. Grind all welds smooth. Field weld hinges to jamb channel; touch up welded areas with hot process repair compound specified. Provide all bolts, brackets, gravity latch, wheels, etc., as noted on drawings or required for complete gate assembly.
- b. Assembly shall be primed & painted a custom color as directed by Architect; refer to Section 09 90 00 – Paintings & Coatings.

3. Steel Support Frame - Counters:

- a. Support frame with wall brackets & counter top angle supports at each end of counter and spaced equally in between (not to exceed 3'-0" o.c.)
- b. Welded construction and wall stud brackets with pre-drilled holes for fasteners.
- c. Field verify all dimensions prior to fabrication.
- d. Assembly shall be primed & painted a custom color as directed by Architect; refer to Section 09 90 00 – Paintings & Coatings.

4. Steel Grate & Embedded Steel Angle Frame:

a. Grate:

- 1) Mfgr: Grating Pacific
- 2) Size: 1-1/2" x 3/16"
- 3) Model: Welded Steel grating
- 4) Type: W-19-4

b. Angle Frame:

- 1) Mfgr: Embed Frame
- 2) Type: EZ Pour frame
- 3) Model: X-150, Type "M" x double angle

- 4) Material: Hot dipped Galvanized Steel
- 5) Size:
 - a) Elevator Pt: 2'-0" x 2'-0"
 - b) Boot wash, equipment enclosure: (2) piece - Refer to plan details
- 5. Rod and Turn Buckle / Clevis Assembly:
 - a. Rods:
 - 1) Manufacturer: Cleveland City Forge, 800.432-4350
 - 2) Series: RTF
 - 3) Diameter: 1-1/2"
 - 4) Length: Refer to Drawings and coordinate with Shop Drawings
 - 5) Type: Each end threaded
 - 6) Material/Finish
 - a) Stainless Steel with Electro Polish finish
 - 7) Quantity: Two rods each condition in equal lengths
 - b. Turnbuckles:
 - 1) Manufacturer: Cleveland City Forge, 800.432-4350
 - 2) Series: TB
 - 3) Diameter: Size to accommodate Rod
 - 4) Material / Finish
 - a) Stainless Steel with Electro Polish finish
 - c. Clevises:
 - 1) Manufacturer: Cleveland City Forge, 800.432-4350
 - 2) Series: CL
 - 3) Diameter: Size to accommodate Rod
 - 4) Grip width: -
 - 5) Material / Finish:
 - a) Stainless Steel with Electro Polish finish
 - d. Clevis Pins:
 - 1) Manufacturer: Cleveland City Forge, 800.432-4350
 - 2) Series: PH
 - 3) Type: Headed
 - 4) Diameter: Size to accommodate Clevis
 - 5) Material / Finish:
 - a) Stainless Steel with Electro Polish finish
 - e. Assembly shall be primed & painted a custom color as directed by **Architect**; refer to Section 09 90 00 – Paintings & Coatings.
- 6. Cable and Turn Buckle Assembly:
 - a. Rods:

- 1) Manufacturer: CarlStahl, www.CarlStahl.com
- 2) Contact: Kevin New, 650.465-1227, kevinnew@ix.netcom.com
- 3) Series: DecorCable
- 4) Cable Diameter: 1/4" [Specifier, verify]
- 5) Length:
 - a) Refer to drawings and coordinate with Shop Drawings
 - b) Field Verify
- 6) Material: Polished Stainless Steel
- b. Assembly:
 - 1) Cable/Turnbuckles and Fork with external threads: IK 300-0601
 - 2) Eye Bolts with external threads:
 - a) Eye Bolt portion: 838-1000
 - b) Thread portion: M10 all tread (MAC1000)
 - 3) Trim Washer: 836-1000-05
 - 4) Washer: 896-1000-30
 - 5) Nuts: 892-1000 M10 Hex Nut
 - 6) Capacity: 3,700 lbs. [Specifier, verify]
7. Escutcheons:
 - a. Application: Pipe penetrations thru ceiling panels
 - b. Mfgr: Plumbing Supply Co., www.plumbingsupply.com
 - c. Product: Heavy Gauge Escutcheons with Springs
 - d. Type: Two piece with springs
 - e. Material: Chrome plated
 - f. Size: To accommodate pipe diameter
 - g. Model: To accommodate pipe diameter
8. Boots – Pipe penetrations:
 - a. Application: Pipe penetrations thru walls and ceiling
 - b. Mfgr: PIPETITE, www.pipetite.us, www.csdesigns.com, 800.654-5635
 - c. Description: White silicone boot & 316 stainless steel ring with predrilled holes
 - d. Features:
 - 1) Self-sealing
 - 2) 500° temperature rating
 - 3) Hygienic white silicon boot
 - 4) Boots accommodates movement
 - e. Model: PIPETITE Standard
 - f. Size: To accommodate pipe diameters from 3/16" – 7" pipe diameter
 - g. Model: To accommodate pipe diameter

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions.
 - 1. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this work may properly commence.
 - 2. Examine areas and conditions under which work is to be performed.
 - 3. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Obtain **Architect's** approval prior to site cutting or making adjustments not scheduled.
- B. Clean and strip primed steel items to bare metal where site welding is scheduled.
- C. Make provision for erection loads with temporary bracing. Keep work in alignment.
- D. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation under appropriate Sections.

3.4 FABRICATION

- A. General:
 - 1. Verify dimensions on site prior to shop fabrication.
 - 2. Fabricate items with joints tightly fitted and secured.
 - 3. Fit and shop assemble in largest practical sections, for delivery to site.
 - 4. Grind exposed welds flush and smooth with adjacent finished surface. Ease exposed edges to small uniform radius.
 - 5. Exposed mechanical fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of structure, except where specifically noted otherwise.
 - 6. Make exposed joints butt tight, flush, and hairline.
 - 7. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.
 - 8. All exterior assemblies & members shall be fabricated watertight.
 - 9. All steel tube and pipe connections shall be continuously welded water tight and ground smooth.
 - 10. All aluminum tube and pipe connections shall be continuously welded watertight and ground smooth.

- B. Install items plumb and level, accurately fitted, free from distortion or defects.
- C. Field Welding:
 - 1. Perform field welding in accordance with AWS D1.1.
 - 2. Where field welding is applied to existing flexural members involving application of significant amounts of heat to member, provide temporary shoring to prevent deflections.
- D. Finishing
 - 1. Clean surfaces of rust, scale, grease, and foreign matter.
 - 2. Touch-up field welds, scratched or damaged surfaces with primer, except repair exposed galvanized work with hot process field galvanizing, in accordance with manufacturer's published directions.
 - 3. Prepare, prime and paint in accordance with Sections 09 90 00 – Paintings and Coatings unless product comes pre-finished from manufacturer.
 - a. Do not prime surfaces in direct contact bond with concrete or where field welding is required, these areas will be primed and field painted after completion of work.
 - b. All exposed fabrications shall be primed and finish painted.
 - c. All semi-exposed fabrications shall be primed at a minimum.

3.5 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's** NOTICE of "Certificate of Substantial Completion".

END OF SECTION 05 50 00

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Rough appropriately graded structural wood framing
 - 2. Rough framing hardware
 - 3. Tackle, guys, braces, scaffolds, staying and equipment necessary to erect components and hold them safely in position until permanent connections are completed.
 - 4. Wood blocking
 - 5. Wood shims

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Plywood Association (APA), www.apawood.org
- E. American National Standards Institute (ANSI), www.ansi.org
- F. American Society For Testing and Materials (ASTM), www.astm.org
- G. American Wood Protection Association (AWPA), www.awpa.com
- H. Forest Stewardship Council (FSC) www.fsc.org
- I. National Fire Protection Agency (NFPA), www.nfpa.org
- J. Underwriters Laboratory (UL), www.ul.com
- K. Western Wood Products Association (WWPA)

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Comply with manufacturers standards.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Fire Treated Plywood	Fire/Smoke Developed	Class A (Class 1)	ASTM E84
Lumber	Moisture Control	19% or less	
Wood Lumber: Sill Plates	Grade	D.F. No. 1 or better	
	Treatment	Pressure treated, PTDF bearing P.T.D.F. stamp	AWPB CBC 2303.1.3
Wood Lumber: Studs	Grade	≤10'-0" long: D.F. No. 2 or better >10'-0" long: D.F. No. 1 or better	
Wood Lumber: Top Plates, Joists, Furring, Purlins, & Beams		No. 1 or better, U.N.O.	
Wood Lumber: Posts			
Wood Lumber: 4 x 8 & larger Beams			
Wood Lumber: Blocking, Bridging, Furring & Stripping		D.F. No. 2 or better	
Wood Lumber: Decking		D.F. No. 1 or better	
		Treatment	
Wood Lumber: Redwood	Grade	Clear and all heart center	
Wood Lumber: Architectural/Trellis		D.F. No. 1, all heart center	
Refer to Drawings and as herein specified.			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. Construction Testing / Inspection by others:

Item	Name of Test	Performance Results	By Whom
Framing and connections	Compliance with design	Comply	Building Inspector

E. Construction Monitoring/Observations by others:

Item	Name of Test	Performance Results	By Whom
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Rough Framing	Const. Waste Management	Comply	Refer to Division 1 for construction waste management and disposal/recycling requirements
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1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.
 - 1. List of materials proposed to be used including fasteners, sealants and adhesives.
 - 2. Shop drawings of all conditions, including plywood, species, grades, stress properties, etc.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. All wood products/materials shall be free of decay, mold, etc.
 - 1. All wood shall be inspected by **General Contractor** prior to installation and all pieces of lumber found to have any sign of mold or fungus shall be rejected and removed from site and replaced by **General Contractor**.
- C. Contractor / Installer/ Fabricator shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- D. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- E. Miscellaneous criteria:
 - 1. Lumber and plywood source quality control: Provide materials graded under one of the following:
 - a. Rules 17, Standard Grading Rules for West Coast Lumber, most current adopted edition - WCLIB.
 - b. Standard Grading Rules for Western Lumber, most current adopted edition - WWPA.
 - c. Standard Specifications for Grades of California Redwood Lumber, most current adopted edition - RIS.
 - d. Plywood Specification and Grade Guide of American Plywood Association, most current adopted edition - APA.
 - 2. Grade mark each piece of lumber.
 - a. Marking must be done by recognized agency.
 - b. Plywood sheathing: Each panel shall be legibly identified as to type, grade and species by APA grade, comply with PS 1-83 (ANSI A199.1)

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. After delivery, be responsible for storage, protection and placing of all items to be installed under this Section.
- C. Repair damaged material and/or work, as directed by **Architect**. All work must be clean and free of soil, grease, dirt, finger or tool marks after installation.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK / SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Plywood sheathing other than structural sheathing
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 02 41 19 – Selective Building Demolition & Protection
 - 3. Section 07 62 00 – Sheet Metal Flashing and Trim
 - 4. Section 09 24 00 – Portland Cement Plaster Assembly
 - 5. Section 09 90 00 – Paintings & Coatings

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
- B. Complete instructions regarding maintenance of the materials, finishes, etc.
- C. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.

1.13 TESTING AGENT

- A. Refer to Division 1 for Testing Laboratory service requirements.
- B. The **Owner** reserves the right to change testing laboratories if the need arises.

1.14 GENERAL SYSTEM DESCRIPTION

- A. Rough framing and sheathing in accordance with specifications, Structural and Architectural drawings.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturer shall be one of the following and as herein listed and in Drawings:
 - 1. Refer to documents and as herein specified
 - 2. Plywood:
 - a. Structural plywood as herein specified and/or indicated in Drawings
 - 3. Wood Lumber
 - a. Selected from listed types & certified manufacturers as herein specified and/or indicated in Drawings.
 - 4. [Pressure Treated Wood](#)
 - 5. [Wolmanized Heavy Duty, www.wolmanized.com](#)
 - 6. Accessories: Simpson Strong Tie, [www.strongtie.com](#)
 - 7. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. Framing Lumber
 - 1. Lumber:
 - a. Species: Coast Region Douglas Fir (DF), unless otherwise noted.

- 1) Lumber designated DF South by WWP A not acceptable.
 - b. All lumber new with no re-use except as permitted by **Architect**.
 - c. No boxed heart permitted in 3x or thicker.
 - d. Schedule: (Grades not less than the following)
 - 1) Refer to Drawings and as herein specified.
- B. Plywood Sheathing
1. Wall supplemental Plywood Sheathing Backing Boards:
 - a. Applications, including, but not limited to;
 - 1) Panel boards
 - 2) Backing boards
 - 3) Wainscot's
 - 4) Non-structural fill
 - b. Specifications
 - 1) Mfgr: Panel Source
 - a) Product: Purekor ® FSC Certified Fire Retardant Plywood
 - i. Ply 5-ply
 - ii. Rating: Class A (Class 1) Fire Retardant
 - a. Testing Standard: ASTM E84 (01)
 - iii. Material: Western Hem/Fir
 - iv. Urea-Formaldehyde free
 - a. All composite wood and agrifiber products shall contain no added urea-formaldehyde resins.
 - b. All laminating adhesives used to fabricate composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins
 - b) Finish: Painted (P1): Refer to drawings and Section 09 90 00 – Paintings & Coatings
 - c) Edges: Butt Edges
 - d) Grooves: None
 - e) Thickness: 3/4"
 - f) Panel Size:
 - i. Install plywood on indicated wall full height and width from floor to top of wall.
 - g) Warranty: 25 year
 2. Structural Sheathing:

- a. Group: I Interior Type CD with Exterior Glue (US Product Standard PS 1-83);
 - b. Edges: T & G edges, unless indicated otherwise
 - c. Exposure: CD Exposure 1, Structural 1.
 - d. Building Code: Section 2306
 - e. Application: Roof and Wall
 - 1) Exposed underside of overhangs
 - a) Rough sawn plywood with rough face exposed / face down.
 - f. Reference: Structural Drawings
3. Nailers
- a. Douglas Fir No. 1 or better
 - b. Refer also to Structural Documents
4. Fire retardant lumber & plywood sheathing/panel boards
- C. Rough Hardware
- 1. Fasteners: Zinc-coated, galvanized for exterior use or when used in exterior walls, in accordance with ASTM A153. Select fasteners for the type, grade and class required for the installation of miscellaneous metal items.
 - a. Standard bolts and nuts: Regular hexagon head type, ASTM A307, Grade A.
 - b. Lag bolts: Square head type, FS FF-B-561.
 - c. Machine screws: Cadmium-plated steel, FS FF-S-92.
 - d. Wood screws: Flat head carbon steel, FS FF-S-111.
 - e. Plain washers: Round, general assembly grade carbon steel, FS FF-W-92.
 - f. Lock washers: Helical spring type carbon steel, FS FF-W-84.
 - g. Fastenings to concrete: Self-drilling or non-drilling concrete anchors, equal to "Red-Head" by Phillips Drill Co., Molly "Parabolt" or "Wej-It Corp., of the sizes indicated or required.
 - h. Nails: Common wire nails or spikes; box nails not permitted. Bright finish finishing nails for all exposed non-structural interior work. Hot-dip galvanized for exterior locations.
 - i. Miscellaneous Fasteners: Steel hardware, joist hangers, post base, framing anchors, tie downs: ASTM A36; galvanized at exterior locations; Simpson, Silver, or approved equal.
- D. Flashing Caps
- 1. Flashing Caps:
 - a. Welded galvanized and painted Sheet metal flashing caps.
 - a) Refer to Section 07 62 00 – Sheet Metal Flashing & Trim and Section 09 90 00 – Paintings & Coatings.

E. Fire Retardant Lumber

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors which would result in poor or potentially defective application, or cause latent defects in workmanship.
 - a. Examine all lumber, plywood, etc to ensure all wood is free of visible signs of decay, fungus, mold, etc.
 - 1) Wood which has any of these defects shall be removed from site and replaced at **General Contractor**'s expense.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

A. General:

1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
2. Install all members straight, true, level, plumb, and firmly anchored in place.
3. Set all horizontal or sloped members with crown up.
4. Do not notch, bore, or cut members for pipes, ducts or conduit, or for other reasons except as shown or as specifically reviewed in advance by **Architect**.
5. Install preservative treated/decay resistant sill plate lumber at all sill locations.
6. Install preservative treated/decay resistant lumber at all locations within 6" of grade/earth

7. Install preservative treated/decay resistant lumber at all locations set on top of concrete floor slabs and/or concrete curbs.
8. Install at all locations indicated on Drawings and/or details.
- B. Bracing: Provide temporary bracing sufficient to keep structure stable, plumb, and in line until completed.
 1. Temporary shoring and bracing for masonry work: Furnish, locate and install as required for adequate support. Leave in place 15 days after masonry has set, unless earlier removal is approved by **Architect**.
- C. Framing:
 1. Bearings: Make all bearings full unless otherwise indicated.
 2. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.
- D. Flashing Caps:
 - a. Install fully welded sheet metal flashing cap with return sides on top of all exposed portions of wood beams, outriggers, Glue Laminated Beams (GLB), etc; refer to Section 07 62 00 – Sheet Metal Flashing & Trim.
 - 1) Run flashing continuous the full length of exposed portion and under adjacent roof, covering, etc. to insure water does not run under the cap.
- E. Blocking and Bridging
 1. Install blocking required to support items of finish and to cut off concealed draft openings, both vertical and horizontal, between ceiling and floor areas.
 - a. Fire Stops: Firestopping shall be provided to cut off all concealed draft openings (both vertical and horizontal) and shall form an effective barrier between stories and between a top story and roof spaces. It shall be used in specific locations, as follows:
 - 1) In exterior or interior stud walls, at ceiling and floor levels.
 - 2) In all stud walls and partitions, including furred spaces, so placed that the maximum dimensions of any concealed space is not over 10 feet.
 - 3) Between stair stringers at top and bottom and between studs along with in line with run of stair adjoining stud walls and partitions.
 - 4) Around top, bottom, sides and ends of sliding door pockets.
 - 5) In spaces between chimneys and wood framing, loose noncombustible supports, or a metal collar tightly fitted to the chimney and nailed to the wood framing may be used.
 - 6) Any other locations not specifically mentioned above, such as holes for pipes, shafting, behind furring strips and similar places which could afford a passage for flames.
 - b. Fire Stops when of wood shall be 2-inch nominal thickness. If the width of the opening is such that more than one piece of lumber is necessary, there shall be two thicknesses of 1-inch nominal material with joints broken or one thickness of 3/4 inch plywood with joints backed by 3/4 inch plywood.

- c. Fire Stops may also be of gypsum board cement, mineral wood or other approved noncombustible materials securely fastened in place.
 - d. Bridging:
 - 1) Install wood cross bridging (not less than 2" x 3" nominal), metal cross bridging of equal strength, or solid blocking between joists where the span exceeds 8'-0".
 - 2) Provide maximum distance of 8'-0" between a line of bridging and a bearing.
 - 3) Cross bridging may be omitted for roof and ceiling joists where the omission is permitted by code, except where otherwise indicated on the drawings.
 - 4) Install solid blocking between joists at points of support and wherever sheathing is discontinuous. Blocking may be omitted where joists are supported on metal hangers.
 - e. Metal Backing Plates (for surface mounted items, furnished by others): Horizontal steel 6" x 16 gauge x distance between vertical supporting studs (3 studs minimum). Refer to drawings details for special requirements.
 - 1) Refer to Section 05 50 00 - Metal Fabrications.
- F. Installation of Plywood Sheathing
- 1. General:
 - a. Place plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise shown on the Drawings.
 - 1) Center joints accurately over supports, unless otherwise shown on the Drawings.
 - 2) Structural sheathing, refer to structural drawings for additional information.
 - 2. Fastening:
 - a. MDO Plywood:
 - 1) Securely fasten with 6d nails on 3/8" & 1/2" panels & with 8d nails on 5/8" & 3/4" panels.
 - 2) Space nails 6" O.C. around all panel edges & 12" O.C. at intermediate supports.
 - 3) Nails should penetrate at least 1" into the substrate material.
 - 4) Maximum support spacing is 24" O.C.
 - 5) Use Spiral or Ring-shank nails, typical.
 - a) Use of Bolts or Screws shall be confirmed with plywood mfr. & **Structural Engineer**.
- G. Fastening General
- 1. Nailing:
 - a. Use only common wide nails or spikes of the dimension shown on the Nailing Schedule, except where otherwise specifically notes on the Drawings.
 - b. For all conditions not covered in the Nailing Schedule provide penetration into the piece receiving the point of not less than 1/2 the length of the nail or spike, provided, however, that 16d nails may be used to connect two pieces of 2" (nominal) thickness.

- c. Nail without splitting wood.
 - d. Pre-bore as required, and prepare at all existing framing.
 - e. Remove split members and replace with members complying with the specified requirements.
 - f. Refer to structural drawings for additional information.
2. Bolting:
- a. Drill holes 1/16" larger in diameter than the bolts being used, maximum.
 - b. Drill straight and true from one side only.
 - c. Do not bare bolts threads on wood, use washers under bolt heads and nut where both bear on wood, and use washers under all nuts.
3. Screws: Driving into place is not permitted. In placing lag screws, first bore holes of same diameter and depth as shank; bore holes for threaded portion of screws with bit no larger than base of thread.
- a. For wood screws, No. 14 and larger, drill lead holes for shank and threaded portions 7/8 times shank and thread root diameter, respectively.

H. Fastening Schedule

- 1. Unless otherwise directed by the **Architect** and/or **Structural Engineer**, comply with the nailing schedule and other fastening requirements contained in the applicable building code.

I. Steel Plates or Shapes Bolted to Wood

- 1. Bore holes in timber shall be bolt diameter plus 1/16" maximum; use steel pieces as templates for locations of holes; tighten nuts or rods and bolts at time of installation and re-tighten before covering up and just before final acceptance of work; examine accessible nuts; cut protruding bolt ends off to within 1/8 inch of bolt head and file all burrs off.
- 2. At wood plate bolted to floor/roof beam top flange, countersink and counter-bore wood plate only as detailed and signed by **Structural Engineer**.
- 3. Nailing: Penetration of nails or spikes not shown otherwise shall be half the length of nails into piece receiving points; however, to connect pieces 2 inches net in thickness, 16d common nails shall be used unless shown otherwise. Do not drive nails closer together than the required penetration, nor closer to edge of piece of lumber or timber than half the required penetration; size of nails to be such that splitting will not occur; bore holes for nails wherever necessary to prevent splitting; bore diameter of hole smaller than diameter of nail spike; see Nailing Notes on Drawings. Wherever nails of normal length may penetrate and show in exposed work, use nail of specified diameter and shorter length.
- 4. Screws: Driving into place not permitted. Soap may be used to lubricate screws. In placing lag screws, first bore holes of same diameter and depth as shank; bore holes for threaded portion of screws with bit no larger than base of thread. For wood screws, No. 14 and larger, drill lead holes for shank and threaded portions 7/8 times shank and thread root diameter, respectively.
- 5. Steel plates or shapes bolted to wood: Bore holes in timber shall be bolt diameter plus 1/16"; use steel pieces as templates for locations of holes; tighten nuts or rods and bolts at time of

installation and re-tighten before covering up and just before final acceptance of work; examine accessible nuts; cut protruding bolt ends off to within 1/8 inch of bolt head and file all burrs off. At wood plate bolted to floor/roof beam top flange, countersink and counter-bore wood plate such that the nut is flush or below (1/4" max. the top of the wood plate).

6. Temporary shoring and bracing for masonry work: Furnish, locate and install as required for adequate support. Leave in place 15 days after masonry has set, unless **Architect** approves earlier removal.

3.5 ADJUSTING

A. Alignment

1. On framing members to receive a finished surface, align the finish subsurface to vary not more than 1/8" from the plane of surfaces of adjacent furring and framing members.

3.6 FINISHING

- A. Refer to Section 09 90 00 – Paintings & Coatings
- B. Refer to Section 09 24 00 – Portland Cement Plaster Assembly.

3.7 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
- G. Leave entire area in a neat, clean, acceptable condition.
- H. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- I. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- J. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 06 10 00

SECTION 06 64 13 – FRP WALL PANELS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work, including, but not limited to:
 - 1. Fabrication and installation of custom sized and shaped configurations including but not limited to:
 - a. Fiberglass Reinforced Wall Panel system (FRP)
 - 1) Trim and associated accessories
 - 2) Adhesive
 - 3) Sealants for "Fiberglass Reinforced Plastic" (FRP)
 - 4) Fasteners
 - b. Outside Corner Guards – Stainless Steel

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American National Standards Institute (ANSI)
 - 1. ANSI/AHA A135.5 - Prefinished Hardboard Paneling; most current edition.
- E. American Society For Testing and Materials (ASTM)
 - 1. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 1997
 - 2. ASTM D523 - Standard Test Method for Specular Gloss; 1989 (Reapproved 1994).
 - 3. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998.

4. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 1997.
5. ASTM D696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer; 1998
6. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 1997
7. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 1998
8. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 1993
9. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 1996a
10. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes; 1987 (Reapproved 1998).
11. ASTM D2197 - Standard Test Methods for Adhesion of Organic Coatings by Scrape Adhesion; 1998
12. ASTM D2486 - Standard Test Method for Scrub Resistance of Wall Paints; 1996.
13. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; 1995.
14. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1998
15. ASTM numbers as herein listed.

1.3 PERFORMANCE, TESTING AND INSPECTION

A. **General:**

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Testing shall be done as herein specified and as listed in drawings.
5. Refer to Division 1 for additional requirements for DSA projects

B. **Standards:**

Item	Name of Test	Performance	Testing Std.
Fiberglass Reinforced Panel	Sanitary	As herein noted	As herein noted
		Comply	USDA/FSIS
	Fire rating	As herein noted	ASTM – E84
	Sizes: W x H x Thk	48" x 96" x 3/32" 48" x 120" x 3/32"	Mfgr.

Surface Properties	Abrasion	Complies	ASTM D968-81 ASTM D2197-91 ASTM D3002
	Cleanability/Stain Resistance		NEMA LD 3-2000 sec 3.4
			NEMA LD 3-2000 Sec 3.5
Adhesive	VOC compliant	2.6 g/l max	MSDS #3989
Refer to drawings and as herein specified			

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturers data and shop drawings.
 - 1. Data: Submit manufacturer's descriptive data and detailed shop drawings for systems, including finish systems.
 - a. Include copy of I.C.B.O. report.
 - 2. Drawings shall show installation layout including location of all joints and accessories.
- E. Samples:
 - 1. Submit colors and textures as herein specified and as listed in drawings.
 - 2. Submit 12"W x 12"H (minimum) sample of panel in color(s) and texture(s) indicated; utilize tools and techniques proposed for installation.
 - 3. Submit samples of trim and accessories

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for five (5) years providing / installing / finishing similar size projects and complexity.
- C. Manufacturer shall have been in business for five (5) years providing/installing/finishing similar size projects and complexity.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

- D. Building shall be fully enclosed and temperature at 70 degrees with code compliant ventilation.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
 - 1. Panels shall be allowed to acclimate to room temperature of 70 degrees for a minimum of 48 hours prior to installation.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.
 - 1. Do not install products under environmental conditions outside manufacturer's absolute limits.
- C. Ensure wall has Level 3 finish per Section 09 29 00 prior to commencing installation.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish one (1) year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Floor finish
 - 2. Wall construction and finish
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 09 29 00 – Gypsum Board & Sheathing Substrates
 - 3. Section 09 65 13 – Resilient Base and Accessories

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturer shall be one of the following and as listed herein and in Drawings:
 - 1. Marlite 330.343-6621, www.marlite.com
 - 2. Kemlite by Crane Composites, www.kemlite.com
 - 3. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. Schedule:
 - 1. Panels:
 - a. Mfgr: Marlite
 - b. Material: Fiberglass Reinforced Thermosetting polyester resin panel sheets
 - c. Sizes: Use longest size to minimize butt joints
 - d. Model(s):
 - 1) Standard:
 - a) Fire rating: Comply with ASTM 5319
 - i. Class I/A: Pebbled texture
 - a. Flame spread: < 25
 - b. Smoke developed: < 450

- ii. Class II/C: Smooth
 - a. Flame spread: < 200
 - b. Smoke developed: < 450
 - b) Sanitary: USDA/FSIS approved, ASTM D3273-94 and 95
 - c) Color: Architect to select from standard manufacturer options
 - d) Finish: As noted
2. Trim:
- a. Mfgr: Marlite
 - b. Lengths: 8'-0" a 10'-0' – use lengths to minimize joints
 - c. Schedule:
 - 1) Extruded PVC Trim
 - a) Components:
 - i. M 350 Inside Corner
 - ii. M 360 Outside Corner
 - iii. M 365 Division
 - iv. M 370 Edge
 - b) Finish / Color: Architect to select from standard manufacturer options
3. Outside Corner Guard (Wall protection corner)
- a. Mfgr: Marlite
 - b. Material: Stainless Steel
 - c. Model: F560
4. Base Molding:
- a. Mfgr: Marlite
 - b. Material: PVC – extruded with integral color
 - c. Components:
 - 1) M 612 FRP Base Molding
 - 2) M 651 Inside Corner
 - 3) M 660 Outside Corner
 - 4) M 620 LH End Cap
 - 5) M 625 RH End Cap
 - a) Finish / Color: Architect to select from standard manufacturer options

- a. Mfgr: Marlite
 - b. Application: Install in accordance with manufacturer's recommendations.
 - c. Schedule:
 - 1) MS-250 Clear Silicone
6. Adhesives:
- a. Mfgr: Marlite
 - b. Product: Water resistant, non-flammable adhesive
 - c. Model: C-551
 - d. Std: ASTM C557

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - EXECUTION

3.1 INSPECTION /EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.
- B. Examine surfaces to receive panels for:
 - 1. Substrates contrary to recommendations of system manufacturer.
 - 2. Miss aligned substrate that will adversely affect execution and quality of work.
 - 3. Deviation tolerance for installed substrate shall not exceed for both vertical and horizontal 1/8 inch in 20'-0". Tolerance deviation shall not be collective.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.
- B. Take panels out of cartons and allow to acclimatize to room conditions for at least 48 hours prior to installation.

- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- D. Clean surfaces thoroughly prior to installation.
- E. Protect existing surfaces from damage due to installation.

3.4 FABRICATION

- A. Verify dimensions on site prior to shop fabrication.
- B. Fabricate panels to size and shape required for tightly fitted joints or as required by manufacturer.
- C. Ease all exposed edges to small uniform radius.
- D. No exposed mechanical fastening shall be permitted other than trim moldings.
- E. Supply all accessories required for installation.

3.5 INSTALLATION

- A. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- B. Install panels in accordance with manufacturer's instruction and these specifications, and reviewed shop drawings.
 - 1. Refer to installation instructions for Marlite Brand FRP panels and fire rated panels
- C. Use the adhesives recommended by the panel manufacturer unless prohibited by local regulations; obtain manufacturer's approval of alternative adhesives.
- D. Install continuous bead of silicone sealant in each joint and trim groove and between trim and adjacent construction, maintaining 1/8 inch (3 mm) expansion space.
 - 1. Panels shall be installed to accommodate 1/8" of movement.
- E. All panels shall be installed to a horizontal and vertical tolerance of 1/8 inch in 20 ft.
 - 1. Tolerance deviation shall not be collective.
 - 2. Seal total perimeter and at all joints with manufacturer's approved materials as detailed and shown on shop drawings.
 - 3. Avoid contamination of panel faces with adhesives, solvents, or cleaners; clean as necessary and replace if not possible to repair to original condition.
 - 4. Protect installed products until completion of project.
 - a. Touch-up, repair or replace damaged products after Substantial Completion.

3.6 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.

- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's** NOTICE of "Certificate of Substantial Completion".

END OF SECTION 06 64 13

SECTION 07 26 00 – COLD APPLIED SELF-ADHERING MEMBRANE

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable extents, dimensions, clearances and other associated materials at the jobsite.
- D. Furnish materials and perform labor per each specific scope of work required to execute this work as indicated on the drawings, as specified herein, and as indicated in each specification section referred to herein and as necessary to complete the work required by project conditions, including, but not limited to:
 - 1. Cold Applied Self Adhering Membrane (CASAM) flexible flashing for above grade conditions.
 - 2. Coordinate with Water Resistant Barrier
 - a. Refer to Section 07 26 00 – Water Resistant Barrier (WRB)

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society for Testing and Materials (ASTM), www.astm.org
 - 1. ASTM C920 Specifications for Elastomeric Joint Sealants
 - 2. ASTM D412 Test Methods for Rubber Properties in Tension
 - 3. ASTM D570 Test Methods for Water Absorption of Plastics
 - 4. ASTM D903 Test Methods for Peel or Stripping Strength of Adhesive Bonds
 - 5. ASTM D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
 - 6. ASTM D1876 Test Methods for Peel Resistance of Adhesives (T-Peel Test)
 - 7. ASTM D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting
 - 8. ASTM D1970 Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 - 9. ASTM D3767 Practice for Rubber-Measurement of Dimensions
 - 10. ASTM D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet

	Method
11. ASTM D4541	Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers
12. ASTM D5034	Test Method for Breaking Strength and Elongation of Textile Fabrics
13. ASTM E96	Test Methods for Water Vapor Transmission of Materials
14. ASTM E154	Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
15. ASTM E1186	Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
16. ASTM E2178	Standard Test Method for Air Permeance of Building Materials
17. ASTM E2357	Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
18. ICC AC 38	Water Resistance: AC 38; Acceptance Criteria for Water-Resistive Barriers

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Detail Membrane	Water Vapor Transmission	2.9 ng/m ² sPa (0.05 perms) max.	ASTM E96 Method B
	Air Permeance	0.0006 L/(s.m ²) (0.00012 cfm/ft ²) max.	ASTM D412 at 75Pa (0.3 in. water) pressure difference
	Puncture Resistance	178 N (40 lbs.) min.	ASTM E154
	Lap Adhesion at -4°C (25°F)	880 N/m (5.0 lbs./in.) of width	ASTM D1876
	Low Temperature Flexibility	Unaffected to -43°C (-45°F)	ASTM D1970
	Tensile Strength	min. 2.7 MPa (400 psi)	ASTM D412, Die C Modified
	Elongation, Ultimate Failure of Rubberized Asphalt	min. 200%	ASTM D412, Die C
Wall Flashing	Water Vapor Transmission	2.9 ng/m ² sPa (0.05 perms) max.	ASTM E96 Method B
	Water Absorption	max. 0.1% by weight	ASTM D570
	Puncture Resistance	356 N (80 lbs.) min	ASTM E154
	Tear Resistance Initiation	min. 58 N (13.0 lbs.) M.D.	ASTM D1004
	Tear Resistance Propagation	min. 40 N (9.0 lbs.) M.D.	ASTM D1938

	Lap Adhesion at -4°C (25°F)	880 N/m (5.0 lbs./in.) of width	ASTM D1876
	Low Temperature Flexibility	Unaffected to -43°C (-45°F)	ASTM D1970
	Tensile Strength	min. 5.5 MPa (800 psi)	ASTM D412, Die C Modified
	Elongation, Ultimate Failure of Rubberized Asphalt	min. 200%	ASTM D412, Die C
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. Construction Monitoring by others:

Item	Name of Test	Performance Results	By Whom
Assembly	Installation	Installation is in accordance with manufacturer's standards & warranty criteria	Product Manufacturer's Representative

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.
 1. Specification Cut sheets for each product
 2. Installation instructions for each product
 3. Surface preparation instructions for each product
- E. Submit samples.
 1. 12" x 12" for each membrane and flexible flashing product/material
- F. Mock Up:
 1. Erect at location approved by **Architect**.
 - a. Mock-up shall be part of final construction once approved by **Architect**.
 - b. Mock-up of wall, corners & horizontal conditions shall comprise of all underlayment, flexible flashing, internal metal flashing components as specified and indicated in Drawings.
 2. Size:
 - a. Wall Membrane: 3'-0" long, 3'-0" square, minimum.
 - b. One door opening
 - c. One window opening

- d. One of any other detail condition
- G. Certification:
 - 1. Provide manufacturer's certification that materials meet specified requirements.
 - 1) Certification List: Shall be reviewed by **Owner** at the time of delivery.
 - 2) Item not certified by supplier shall not be unloaded.
 - 3) Check list for accuracy.
 - 4) Substitutions at the time of delivery are not permitted and shall not be unloaded, but shall be taken off site; Refer to Division 1 for substitution, deviation and/or submittal procedures.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer shall have been in business for **five (5)** years installing/finishing similar size projects and complexity.
- C. Manufacturer shall have been in business for **five (5) years** manufacturing underlayment and flexible flashings and the production and sales of self-adhesive sheet membrane waterproofing.
- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 - 1. Agenda for meeting shall include, but not be limited to;
 - a. Review of submittals.
 - b. Review of surface preparation, minimum curing period and installation procedures.
 - c. Review of special details and flashings.
 - d. Sequence of construction, responsibilities and schedule for subsequent operations.
 - e. Review of mock-up requirements.
 - f. Review of inspection, testing, protection and repair procedures.
- E. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during membrane waterproofing work to review installation procedures.
 - 1. Manufacturer's representative shall review and certify all phases of construction to verify the complete work meets specification requirements.
 - 2. Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.
- F. Miscellaneous criteria:
 - 1. Monitor work to insure installation and assembly are in accordance with applicable standards.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. The membrane and accessory products must be handled properly.
 - 1. Read all product labels and Material Safety Data Sheets (MSDS) for proper handling and disposal.
 - 2. Deliver all materials in manufacturer's unopened packages and store all materials under cover.
 - 3. Do not double stack palletized material.
- C. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations, and material safety data sheets. Protect from damage from sunlight, weather excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
 - 1. Do not double-stack pallets of membrane on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
 - 2. Protect primer and mastic from moisture and potential sources of ignition.
- D. Sequence deliveries to avoid delays, but minimize on-site storage.
- E. Proceed with installation only when substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, substrates, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
- B. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's **five (5)** year warranty that air barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.

1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 1. Wall, sill, parapet and soffit sheathings
 2. Wall openings
 3. Roof assembly
 4. Roof openings
 5. Exterior wall finish
 6. Metal flashing
 7. Gutters and drainage systems
 8. Substrate
- B. Related Sections include, but are not limited to the following:
 1. Division 1
 2. Section 02 41 19 – Selective Building Demolition & Protection
 3. Section 06 10 00 – Rough Carpentry
 4. Section 07 26 00 – Water Resistant Barrier (WRB)
 5. Section 07 62 00 – Sheet Metal Flashing and Trim
 6. Section 07 92 00 – Sealants and Caulking
 7. Section 08 11 13 – Steel Doors & Frames
 8. Section 08 51 13 – Aluminum Windows
 9. Section 09 24 00 – Portland Cement Plaster Assembly
 10. Section 09 29 00 – Gypsum Board & Sheathing Substrates

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 1. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. Coordinate with the installation of other waterproof sheet membranes as an integral part of this scope.
- D. Coordinate with installation of sheet metal flashing by others.

1.13 GENERAL SYSTEM DESCRIPTION

- A. Flexible flashing in accordance with manufacturer's installation instructions and as detailed.
- B. Flashing at wall openings:

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturers shall be the following:
 - 1. GRACE Construction Products, www.gcpat.com/en/solutions
 - 2. Henry, us.henry.com
 - 3. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. Flexible Flashing:
 - 1. General:
 - a. Widths: As required to meet design criteria and as needed to build up multiple strips with 3" overlap to meet overall width criteria.
 - 2. Mfgr: Grace Construction Products
 - a. Application: Through-wall flashing detailing
 - 1) Product: Perm-A-Barrier Wall Flashing
 - 2) Type: Heavy Duty, fully adhered membrane
 - 3) Available widths: 12", 18", 24", 36"
 - 4) Description: 32 mil (0.8 mm) of self-adhesive rubberized asphalt integrally bonded to 8 mil (0.2 mm) of cross-laminated, high-density polyethylene film to provide

a min. 40 mil (1.0 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

b. Application: Detail Flashing

- 1) Product: Perm-A-Barrier Detail Membrane
- 2) Type: Heavy Duty, fully adhered membrane
- 3) Available widths: 6", 9", 12"
- 4) Primer: 36 mil (0.9mm) of self-adhesive rubberized asphalt integrally bonded to 4 mil (0.1 mm) of cross-laminated, high-density polyethylene film to provide a min. 40 mil (1.0 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed

B. Primers:

1. Product: Perm-A-Barrier WB Primer (or as recommended by CASAM mfr.)
2. Type: Water-based primer which imparts an aggressive, high tack finish on the treated substrate.
 - a. Flash Point: No flash to boiling point
 - b. Solvent Type: Water
 - c. VOC Content: Not to exceed 10 g/L
 - d. Application Temperature: -4°C (25°F) and above
 - e. Freezing point (as packaged): -7°C (21°F)

C. Penetrations & Termination Sealant

1. Liquid Membrane for Details and Terminations:
 - a. Bituthene Liquid Membrane manufactured by GCP Applied Technologies; a two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.
2. Substrate Patching Membrane:
 - a. Bituthene Liquid Membrane manufactured by GCP Applied Technologies; a two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.
3. Joint Sealant:
 - a. Refer to sealant manufacturer's recommendations and Section 07 92 00 – Sealants and Caulking

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - EXECUTION

3.1 INSPECTION/EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.
 - a. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- C. Coordinate work with Water Resistant Barriers (WRB) addressed under other specifications.

3.3 PREPARATION

- A. Prepare area if work in accordance with manufacturer's recommendations.
- B. Refer to manufacturer's literature for requirements for preparation of substrates.
 1. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Repair deck and/or wall area's before installing the membrane; use repair materials and methods which are acceptable to manufacturer.
 - a. Remove dust, dirt, loose nails, loose stone, old roofing materials and debris.
 - b. Remove contaminates such as grease, oil, wax from exposed surfaces.
 - c. Remove protrusions, fill voids, and repair damaged, or unsupported areas.
 2. Prime substrates as recommended by manufacturer for each membrane & flexible flashing type.
- C. Cast-in-Place Concrete Substrates:
 1. Do not proceed with installation until concrete has properly cured and dried, minimum 14 days for normal structural concrete.
 2. Fill form tie rod holes with concrete and finish flush with surrounding surface.
 3. Repair holes over 1/2" in length and 1/4" deep and finish flush with surrounding surface.
 4. Remove scaling to sound, unaffected concrete and repair exposed area.

5. Grind irregular construction joints to suitable flush surface.
 6. Refer to Section 03 00 61 – Concrete Floor Leveling, Patching, and Grouting.
- D. Masonry Substrates: Apply membrane over concrete block and brick with smooth trowel-cut mortar joints or parge coat.
1. Confirm with manufacturer for primer requirements.

3.4 INSTALLATION

A. General:

1. Perform work in accordance with manufacturer's recommendations, as herein specified, and in accordance with drawings and details.
 - a. Flexible flashing membranes shall be fully adhered, typical.
 - b. Install additional layers of CASAM as detailed.
2. Install in coordination with water resistant barrier, and wall and roof material manufacturer's recommendations.
3. Prime substrates, typically in accordance with membrane manufacturer's recommendations.
4. Apply membrane only in fair weather when the air, substrates, and membrane are at temperatures in accordance with those specified in membrane manufacturer's product data and installation instructions.
5. Install membrane on vertical and horizontal substrates in accordance with manufacturer's recommendations.
6. Consistent with good roofing and wall assembly practice, install the roof and wall membranes/flashing membrane such that all laps shed water.
 - a. Always work from the low point to the high point of the roof wall.

B. Flexible Flashing:

1. Windows:
 - a. Install in accordance with manufacturer's written installation instructions.
 - b. Install additional layers of CASAM as detailed to tie in other flashing and sheet metal flashing.
 - c. Coordinate with wall finish specifications.
 - d. Coordinate with window type, flanged or not flanged and door types, flanged and not flanged.
2. Dissimilar Material:
 - a. Install strip of membrane over the top of water resistant barrier and substrate at all edge conditions where wall material such as, but not limited to plaster adjoins a dissimilar material.

- b. Allow for 3" width of adhesion of cold applied self-adhering waterproof membrane to substrate sheathing, unless required otherwise by manufacturer.
 - c. Install in continuous strips as is physically capable.
 - d. Install in shiplap fashion typically.
- C. Primers, Sealants, and Termination Accessories
 - 1. Per manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 - 1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 - 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.
- C. Do not leave flexible flashings permanently exposed to sunlight longer than 90% of the maximum allowable time frame as specified by the membrane manufacturer for each product.
- D. Do not install Waterproof membrane underlayments directly under roof coverings especially sensitive to corrosion, such as zinc, without providing proper ventilation.
- E. Repair holes, fish mouths, tears, and damage to membrane with a patch of membrane with a patch of membrane extending (6") in all directions.
 - 1. If fasteners are removed leaving holes in the waterproof membrane underlayment, and easing the membrane must be patched.
- F. Do not install fasteners through the membrane over unsupported membrane areas of the Substrate.
- G. Do not install low temperature membranes under metal roofing.

3.6 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.

- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 07 26 00

SECTION 07 21 00 – BUILDING INSULATION

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Thermal, Rigid and Acoustical insulation at, but not limited to: exterior & interior walls, soffit framing, and ceilings, and as indicated on the documents & as specified herein.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society for Testing Materials (ASTM)
 - 1. ASTM E84 Surface Burning Characteristics of Building Materials
 - 2. ASTM E96 Water Vapor Transmissions of Materials
 - 3. ASTM E136 Behavior of Materials in a Vertical Tube Furnace at 750°C
 - 4. ASTM C423 Sound Absorption and the Sound Absorption Coefficient by the Reverberation Room Method
 - 5. ASTM C553 Specification for Mineral Fiber Blanket and Felt Insulations
 - 6. ASTM C612 Specification for Mineral Fiber Block and Board Thermal Insulation
 - 7. ASTM C665 Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. **General:**
 - 1. Comply with manufacturer's standards.

2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

1. Insulation Manufacturer test data shall be in compliance with ASTM C1289 US Test method to determine LTTR (Long Term Thermal Resistance) R-Values.

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Submit Manufacturer's data and MSDS sheets for each product intended for use.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing / installing / finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- D. Stipulations:
 1. Comply with insulation requirements as herein specified and as indicated in drawings.
- E. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 1. Agenda for meeting shall include extent of insulation for all insulation types specified for project.
 2. General **Contractor** shall request meeting 5 days in advance of construction.
- F. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation work to review installation procedures.
 1. Manufacturer's representative shall review and certify in writing all phases of construction to verify the complete work meets specification requirements.
 2. Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.

G. Miscellaneous criteria:

1. Insulation shall be placed and secured in place as herein specified, indicated in drawings and in compliance with manufactures instructions, most restrictive shall apply.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.
- C. Label insulation packages to include material name, production date and/or product code.
- D. Deliver insulation to site in original, unbroken and unopened containers. Store material off ground in dry, protected areas.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 1. Wall Construction
 2. Ceiling and Soffit Construction
 3. Attics and Cavities
 4. Roof Construction
- B. Related Sections include, but are not limited to the following:
 1. Division 1
 2. Section 09 29 00 – Gypsum Board & Sheathing Substrates

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 DEFINITIONS

- A. "Friction Fit" implies that insulation is installed full height fully within the wall cavity and in complete contact with all surfaces within the cavity.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 - 1. Thermal and Acoustical Insulation:
 - a. Owens Corning, www.owenscorning.com
 - b. KNAUF Insulation, www.knaufinsulation.us/
 - c. Certain Teed, www.certainteed.com
 - d. Dow Building Solutions, www.building.dow.com/en-us/
 - 2. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require Architect's approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.

2.2 MATERIALS – BUILDING ENVELOPE

- A. Thermal Batt Insulation
 - 1. General:
 - a. Provide at all exterior walls, furring walls at inside face of exterior walls, ceilings, soffits, and inside header assemblies, to provide complete and continuous building thermal envelope.
 - 2. Concealed Conditions:

- a. Manufacturer: Owens Corning
 - b. Type: Unfaced fiberglass batt insulation
 - 1) Meets ASTM C665 Type I, Class A
 - 2) Meets ASTM C1338 Mold/mildew resistant
 - 3) Meets ASTM E136 Non-Combustible
 - c. Product: EcoTouch® Pink® Fiberglas™ Insulation with PureFiber® Technology
 - 1) Exception: Refer to Fire Rated Assembly details and notes for specific insulation requirements for insulation to be used at each rated assembly.
 - d. Installation: Friction Fit to fill cavity
 - e. Application: Fully enclosed and concealed within wall, ceiling, soffit or header cavities
 - f. R-Value, ASTM C518:
 - 1) Wood stud framing:
 - a) 2x4 walls: R-15 3-1/2" thick
 - b) 2x6 walls: R-21 5-1/2" thick
 - c) 2x8 walls: R-22 6-3/4" thick
 - d) 2x10 walls: R-30 9-1/2" thick
 - e) 2x12 walls: R-38C 10-1/4" thick
 - g. Surface Burning Characteristics, ASTM E84:
 - 1) Flame Spread: 10
 - 2) Smoke Developed: 10
 - h. Do not install on top of or within 3" of recessed light fixtures unless the fixtures are approved for such use.
3. Semi-Exposed Conditions (walls, ceilings, soffits, headers, etc.):
- a. Manufacturer: Owens Corning
 - b. Type: FSK (Foil) Faced fiberglass batt insulation
 - 1) Meets ASTM C665 Type III, Class A
 - 2) Meets ASTM C1338 Mold/mildew resistant
 - 3) Meets ASTM E136 Non-Combustible
 - c. Product: EcoTouch® Flame Spread 25 Fiberglas™ Insulation with PureFiber® Technology
 - d. Application: Exposed above ceilings / within interstitial spaces but not visible in finished, occupied space

- e. Installation: Friction Fit to fill cavity
 - 1) Provide extended flanges as required for proper installation within wall and/or ceilings where insulation has greater depth than stud cavity
 - f. R-Value, ASTM C518:
 - 1) Wood stud framing, 16" and/or 24" width:
 - a) 2x4 walls: R-13 3-1/2" thick
 - b) 2x6 walls: R-21 5-1/2" thick
 - c) 2x8 walls: R-22+ Multiple layers of R-11 and/or R-13 to fill cavity
 - d) 2x10 walls: R-30 Multiple layers of R-13 and/or R-21 to fill cavity
 - e) 2x12 walls: R-38 Multiple layers of R-13 and/or R-19 to fill cavity
 - g. Surface Burning Characteristics, ASTM E84:
 - 1) Flame Spread: 25
 - 2) Smoke Developed: 50
 - h. Do not install on top of or within 3" of recessed light fixtures unless the fixtures are approved for such use.
 - i. Where multiple layers are required, install concealed second layer using un-faced product.
4. Exposed Conditions (walls, ceilings, soffits, headers, etc.):
- a. Manufacturer: Owens Corning
 - b. Type: PSK (white polypropylene) Faced fiberglass batt insulation
 - 1) Meets ASTM C665 Type II, Class A
 - 2) Meets ASTM C1338 Mold/mildew resistant
 - 3) Meets ASTM E136 Non-Combustible
 - c. Product: EcoTouch® Flame Spread 25 Fiberglas™ Insulation with PureFiber® Technology
 - d. Application: Exposed and visible in finished, occupied space
 - e. Installation: Friction Fit to fill cavity
 - 1) Provide extended flanges as required for proper installation within wall and/or ceilings where insulation has greater depth than stud cavity
 - f. R-Value, ASTM C518:
 - 1) Wood stud framed walls, 16" and/or 24" width:
 - a) 2x4 walls: R-13 3-1/2" thick
 - b) 2x6 walls: R-21 5-1/2" thick
 - c) 2x8 walls: R-22+ Multiple layers of R-11 and/or R-13 to fill cavity

- d) 2x10 walls: R-30 Multiple layers of R-13 and/or R-21 to fill cavity
- e) 2x12 walls: R-38 Multiple layers of R-13 and/or R-19 to fill cavity
- g. Surface Burning Characteristics, ASTM E84:
 - 1) Flame Spread: 25
 - 2) Smoke Developed: 50
- h. Light Reflectance: 0.80
- i. Do not install on top of or within 3" of recessed light fixtures unless the fixtures are approved for such use.
- j. Where multiple layers are required, install concealed second layer using un-faced product.

2.3 MATERIALS – INTERIOR

A. Acoustic Insulation:

- 1. General:
 - a. Provide acoustic batt insulation at all interior walls, framed ceilings, framed soffits, and inside header assemblies, unless otherwise noted.
 - b. Provide acoustic batt insulation loose-laid above suspended acoustic ceilings where noted on drawings.
- 2. Concealed Conditions
 - a. Manufacturer: Owens Corning
 - b. Type: Unfaced Fiberglass Acoustic Batt Insulation
 - 1) Meets ASTM C665 Type I, Class A
 - 2) Meets ASTM E136 Non-Combustible
 - c. Product: Sound Attenuation Batt Insulation
 - d. Installation: Friction Fit to fill cavity
 - e. Application: Fully enclosed and concealed within wall, ceiling, soffit or header cavities
 - f. Surface Burning Characteristics, ASTM E84:
 - 1) FlameSpread: 10
 - 2) Smoke Developed: 10
 - g. Do not install on top of or within 3" of recessed light fixtures unless the fixtures are approved for such use.
- 3. Semi-Exposed Conditions – Lay-in above suspended acoustic ceilings
 - a. Manufacturer: Owens Corning

- b. Type: Unfaced Fiberglass Acoustic Batt Insulation
 - 1) Meets ASTM C665 Type III, Class A
 - 2) Meets ASTM E136 Non-Combustible
- c. Product: Sonobatts® Insulation
- d. Application: Exposed above ceilings / within interstitial spaces but not visible in finished, occupied space
- e. Installation: Loose-laid above suspended acoustic ceilings where indicated on drawings
- f. Surface Burning Characteristics, ASTM E84:
 - 1) FlameSpread: 10
 - 2) Smoke Developed: 10
- g. Do not install on top of or within 3" of recessed light fixtures unless the fixtures are approved for such use.

2.4 ACCESSORIES

A. Venting Products

- 1. Rafter venting into attic at transition above wall top plate to eave
 - a. Mfgr: Owens/Corning
 - b. Product: Raft-R-Mate, attic-rafter vents
 - c. Material: Polystyrene
 - d. Size: 22-1/2" x 48"
 - 1) Can be split in half for 12" wide framing
 - e. Net Free Air Flow: 22-1/3 sq. in. (full piece)
 - f. Installation:
 - 1) Install as herein specified and in accordance with manufacturer's recommendations.
 - g. ASTM E84
 - 1) Flame Spread: 5
 - 2) Smoke Developed: 25

B. Impaling pins with retaining clips

- 1. Corrosion resistant spindle anchor and self-locking washer type consisting of perforated metal plates with spindle welded to center and self-locking washers.

2.5 OTHER MATERIAL

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - **EXECUTION**

3.1 INSPECTION/EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.
- B. Remove, or protect against, projections in construction framing which may damage or prevent proper installation of insulation.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- C. Coordinate installation of insulation that needs to be installed prior to the erection of wall and/or ceiling framing.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

- A. General:
 - 1. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as submitted to and reviewed by the **Architect**, anchoring all components as indicated into position.
 - 2. Install thermal insulation with snug fit at sides and firmly butted ends with no open space existing at perimeter or in between.
 - 3. ANCHOR AND INSTALL LOCATIONS AS REQUIRED BY CONSTRUCTION TYPE & IN ACCORDANCE WITH MFGR'S RECOMMENDATIONS:
 - a. For additional installation methods & details of installation, refer to manufacturer's standard details & specifications.
 - b. Install insulation product such that insulation fits full width between framing members.
 - c. At enclosed roof / ceiling structures install in compliance with CBC
 - d. Provide insulation with extended nailing flanges where framing members are shallower than insulation.
 - 4. Where wall framing width differs, install sufficient insulation thickness (or combination of multiple layers) to entirely fill cavity and header by width and height.
 - 5. Install insulation full cavity fill inside all metal stud headers and jambs.

6. For additional installation information, refer to Part 2 schedule of materials as herein specified.

B. Venting:

1. Rafter venting into attic at transition above wall top plate to eave.

a. Refer to Section 07 84 00 for additional venting requirements, including but not limited to eave vents

b. Installation

1) Installed properly against the underside of the rood deck, between roof trusses or rafters, Raft-R-Mate will provide in excess of a 1" air space.

a) Staple in place to sheathing.

2) Fibrous insulation will be installed directly against the surface of Raft-R-Mate and Raft-R-Mate will maintain a free air flow channel from the eave vent to the ridge or gable vents.

3) Due to its symmetrical design, Raft-R-Mate can be split in half for 12" o.c. rafter spacing, or if required for retrofit or cathedral ceiling applications.

c. Installing loose fill or batt insulation on/between attic framing

1) A single 4' length of Raft-R-Mate should be installed in each rafter or truss space, at the ceiling line, to ensure that the airway between soffit and attic space remains open.

2) The vent should extend some distance beyond the top of the horizontal fibrous insulation.

3.5 FIELD QUALITY CONTROL

A. Monitor work to insure installation and assembly are in accordance with applicable standards.

3.6 PROTECTION AND CLEAN UP

B. Refer to Division 1 for protection and cleaning requirements.

C. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.

D. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

E. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.

F. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.

G. After completion of work in this section, remove all erection equipment and implements of service, and debris.

1. Leave entire area in a neat, clean, acceptable condition.

H. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.

- I. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- J. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 07 21 00

SECTION 07 26 00 – WATER RESISTANT BARRIER (WRB)

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Water Resistant (air/vapor) barrier assembly
 - a. Base Layer:
 - b. Top Layer:
 - 2. Accessories
 - 3. Coordinate with Flexible Flashing
 - a. Refer to Section 07 13 26 – Cold Applied Self Adhering Waterproof Membrane

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society For Testing and Materials (ASTM), www.astm.org
 - 1. ASTM D779 Water Resistance
 - 2. ASTM D828 Tensile Strength
 - 3. ASTM D1117 Tear Strength
 - 4. ASTM D3786 Bursting Strength
 - 5. ASTM D5034 Dry Tensile Strength
 - 6. ASTM D5736 Thickness
 - 7. ASTM E84 Flame Spread and Smoke Developed

8. ASTM E96(A) Water Vapor Transmission Rate (perm rating)
9. ASTM E283 Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors
10. ASTM E1677 Air Porosity (seconds)
11. ASTM E2178 Air Permeance
- E. National Fire Protection Association
 1. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components
- F. International Code Council
 1. ICC-AC38 Acceptance Criteria for Water-Resistive Barriers

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Water Resistant Membrane (air/vapor)	Basis Weight	3.12 oz/yd ² or 21.66 lb/msf	TAPPI T410
	Thickness	14.5 mil	ASTM D5736
	Bursting Strength	66 psi	ASTM D3786
	Air Porosity	>4000 sec	TAPPI 460
	Air Permeance of Building Materials	.0047 L/s/m ²	ASTM E2178
	Air Retarder Material or System for Low Rise Framed Building Walls	.01 cfm/ft ² @ 75 Pa	ASTM E1677 (ASTM E283)
	WVTR (AC38)	91.24 f/m ² /24 hrs	ASTM E96 (A)
	Water Vapor Permeance (AC38)	13 Perm	ASTM E96 (A)
	Water Resistance (Hydrostatic Pressure Resistance)	959 cm	AATCC 127-2003
	Water Resistance (AC38 3.3.2)	Pass	ASTM D-779 (Boat Test)
	Tear Strength (Trapezoidal Tear)	MD – 13.1 lbs CD – 17.0 lbs	ASTM D1117 (ASTM D5733)
	Tensile Strength (AC38 3.3.1)	MD – 30 lbs CD – 30 lbs/in	ASTM D828
	Dry Tensile Strength (AC38 3.3.1)	MD – 59 lbs CD – 56 lbs	ASTM D5034

	Flame Spread	0 Class A	ASTM E84
	Smoke Developed	70 Class A	ASTM E84
	Pliability (AC38)	Pass	AC-38
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. Construction Monitoring/Observations by others:

Item	Name of Test	Performance Results	By Whom
Assembly	Wall opening installation compliance	Comply with installation requirements of mfg. and drawings	Product representative

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Submit Manufacturer's data and shop drawings.
 1. Membrane
 2. Tape
 3. Product info. / data sheets
- E. Submit samples
 1. Membrane
 2. Tape
- F. Mock Up
 1. Erect at location approved by Architect.
 - a. Mock-up shall be part of final construction once approved by Architect.
 - b. Mock-up shall comprise of all components and finishes as specified and indicated in Drawings.
 2. Mock-ups
 - a. Wall surface, wall corners, door opening, and window opening
 - b. Create as part of overall Wall Assembly and Flexible Flashing mockups.

- 1) Mock-up of wall, corners & horizontal conditions shall comprise of all underlayment, flexible flashing, internal metal flashing components as specified and indicated in Drawings.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Water Resistant Barrier (Section 07 26 00) and Cold Applied Self-Adhering Membrane (CASAM) specified herein shall be provided through a single source and from a single manufacturer.
- C. Contractor /Installer/Fabricator shall have been in business for **five (5)** years providing / installing / finishing projects of similar size and complexity.
- D. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- E. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation membrane installation work to review installation procedures.
 1. Manufacturer's representative shall review and certify all phases of construction to verify the complete work meets specification requirements.
 2. Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.
- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 1. Agenda for meeting shall include, but not be limited to;
 - a. Review of submittals.
 - b. Review of surface preparation, minimum curing period and installation procedures.
 - c. Review of special details and flashings.
 - d. Sequence of construction, responsibilities and schedule for subsequent operations.
 - e. Review of mock-up requirements.
 - f. Review of inspection, testing, protection and repair procedures.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. After delivery, be responsible for storage, protection and placing of all items to be installed under this Section. Repair or replace damaged work, as directed by **Architect**. All work must be clean and free of soil, grease, dirt, finger or tool marks after installation.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

1.8 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's **five (5)** year warranty that water resistant barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.9 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 1. Wall framing
 2. Wall sheathing
 3. Windows
 4. Doors
- B. Related Sections include, but are not limited to the following:
 1. Division 1
 2. Section 06 10 00 – Rough Carpentry
 3. Section 07 13 26 – Cold Applied Self-Adhering Membrane – CASAM
 4. Section 07 21 00 – Building Insulation
 5. Section 07 62 00 – Sheet Metal Flashing and Trim
 6. Section 07 92 00 – Sealants and Caulking
 7. Section 09 29 00 – Gypsum Board and Sheathing Substrates

1.10 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 1. Complete instructions regarding maintenance of the materials, etc.
 2. Refer to Division 1 for closeout submittal procedures.

1.11 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 - 1. Grace Construction Products, www.gcpat.com/en/solutions
 - 2. Henry, us.henry.com
 - 3. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require Architect's approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 WATER RESISTANT MEMBRANE

- A. Provide membrane wrap (wall wrap, window, door opening & header wrap) in accordance with manufacturer's specifications:
 - 1. Coordinate the installation of material with other window and door waterproof membrane installation.
- B. **Membrane:**
 - 1. **Type:** **Water Resistant Membrane – Base Layer**
 - a. Mfgr.: Grace Construction Products
 - b. Product: Perm-A-Barrier VPS 30
 - c. Description: Primerless, self-adhering vapor permeable air and water barrier membrane consisting of a breathable carrier film with a specially designed adhesive.
 - d. Accessories:
 - 1) Perm-A-Barrier NPS detail membrane
 - 2) Perm-A-Barrier Aluminum Flashing

- 3) Perm-A-Barrier Detail Membrane
 - a) Refer to Section 07 13 26 – Cold Applied Self-Adhering Membrane (CASAM)
- 4) Perm-A-Barrier Wall Flashing
 - a) Refer to Section 07 13 26 – Cold Applied Self-Adhering Membrane (CASAM)
- 5) Perm-A-Barrier S100 Sealant
- 6) Bituthene Mastic
- 7) Bituthene Liquid Membrane
- 8) Sealants
 - a) Refer to Section 07 92 00 – Sealants and Caulking

C. Penetrations & Termination Sealant:

- 1. Liquid Membrane for Details and Terminations:
 - a. Bituthene Liquid Membrane manufactured by GCP Applied Technologies; a two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.
- 2. Substrate Patching Membrane:
 - a. Bituthene Liquid Membrane manufactured by GCP Applied Technologies; a two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/L max. VOC content.
- 3. Joint Sealant:
 - a. Refer to sealant manufacturer's recommendations and Section 07 92 00 – Sealants and Caulking

2.3 AIR/VAPOR MEMBRANE

- A. Provide membrane wrap (wall wrap, window, door opening & header wrap) in accordance with manufacturer's specifications:
 - 1. Coordinate the installation of material with other window and door waterproof membrane installation.
- B. Product:
 - 1. **Type: Reinforced Air/Vapor Membrane**
 - a. Model: Commercial wrap, Header wrap & Accessories
 - b. Mfgr.: Tyvek
 - c. Accessories:
 - 1) Tape:
 - a) Tyvek Housewrap Tape

- b) 3M 8086 Cont. Sheathing Tape
- c) Venture Tape #1585 CW
- d) Clipper Tape, mfg. = Cantech Industries
- 2) Attachment to substrates:
 - a) Window & door flanges substrate:
 - i. Latex or polyurethane based sealants or building wrap manufacturer's approved tape
 - b) Masonry substrate:
 - i. Adhesives or caulking with latex or polyurethane base
 - c) Gypsum board:
 - i. Acoustical sealant, (butyl rubber base) screws with washers
 - d) Wood or insulated sheathing board:
 - i. Nails with large heads or nails with plastic washer heads
- d. Installation:
 - 1) Install using manufacturer's Energy saving system
 - 2) Apply paper with horizontal overlaps & tape
 - 3) Install per mfg.'s standard details
- 2. Options:
 - a. Griffolyn: Type: 65
 - b. Raven Industries: FORTRESS WRAP

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.
- B. Surface:
 - 1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.

- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

A. General:

1. Install all vapor membrane membranes straight, true, and firmly anchored in place.
2. Install in accordance with manufacturer's recommendations, at locations indicated on Construction Documents

B. Water Resistant Barrier (WRB) Membrane

1. Prime substrate to receive air barrier membrane as required per manufacturers written instructions
2. Precut pieces of WRB into easily handled lengths.
3. Remove release linear and position membrane carefully before placing against the surface.
4. Install two separate water-resistant barrier layers over entire substrate sheathing and overlap seams.
 - a. Lap horizontal joints 4 inches min.; vertical joints 6 inches min.
 - b. Building paper around corners at least 24 inches before making lap.
 - c. All vertical joints shall be made only over vertical framing member.
5. Install the water-resistant barrier layers in shiplap fashion.
6. Install self-adhering cold applied self-adhering waterproof membrane strips at all openings in conjunction with the water resistant barrier and fit together in shiplap fashion.
7. Install over Cold applied self-adhering waterproof membrane and flexible flashing tight, smooth and without breaks behind trim accessories.
8. Coordinate with details for conditions that require cold applied self-adhering waterproof membrane and flexible flashing to be installed over water resistant barrier.
9. Coordinate with details for conditions that require cold applied self-adhering waterproof membrane and flexible flashing to be installed over control joints, expansion joints, casing beads and/or drip molds, etc.
10. Coordinate the installation of WRB with roof installer to ensure continuity of membrane with roof air barrier.
11. At end of each working day seal top edge of WRB to substrate with termination sealant.
12. Do not expose WRB to sunlight for more than 150 days prior to enclosure.

Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 6 in. in all directions from the perimeter of the affected area.

3.5 COMMISSIONING

- A. Provide factory-certified field service engineer to a site visit to ensure proper system installation and operation under following parameters:
 - 1. Mock ups of window and door openings

3.6 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 - 1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 - 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.7 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.

- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 07 26 00

SECTION 07 28 00 – CONCRETE SLAB VAPOR EMISSION AND ALKALINITY CONTROL TREATMENT

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable extents of work at the jobsite as dictated by areas of concrete tested to exceed acceptable vapor emission levels and alkalinity levels.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 1. Porous or non-porous slab testing to determine and verify substrate conditions and values for:
 - a. Vapor emission
 - b. Humidity
 - c. Ph
 2. Provide remedial liquid applied reduction slab treatment to concrete to bring vapor emissions, relative humidity and alkalinity levels within herein listed levels for slab areas tested to be defective.
 - a. Two component epoxy (refer to levels reduced to and product), solvent free, water-reduced, concrete moisture vapor, alkalinity moisture and Alkalinity salt suppression barrier for prepared substrates for the application of applied flooring to meet listed criteria.
 - b. Two coats minimum unless listed to be three per specific manufacturers.
 - 1) Single coat systems are not acceptable

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Concrete Institute (ACI), www.aci-int.org
 1. ACI 302 The Guide for Concrete Floor and Slab Construction
- E. American Society for Testing and Materials (ASTM), www.astm.org
 1. ASTM C33 Standard Specification for Concrete Aggregates

2. ASTM D1308 Chemical Resistant to Alkali
3. ASTM D4541 Pull-off Adhesion Strength of Coatings Using Portable Tester
4. ASTM E96 Water Vapor Transmission of Materials
5. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
6. ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
7. ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Slabs Using *in-situ* Probes"

F. Ceramic Tile Institute (TCA), www.ctioa.org

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Testing shall be done as herein specified and as listed in drawings.
5. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Concrete preparation	Shot Blasting	#4 profile (CSP)	ICRI
Properties of concrete after treatment	Water Vapor Transmission (WRT)	3.0 lbs max. (tested up to 20lbs)	ASTM E96
	Water Vapor Permeance (WVP)	8.1 Grams/Pa-s-m ² x 10 ⁻⁸ max	ASTM E96
	Chemical resistant	Tolerant to 14pH alkali exposure, 30 day resistance	ASTM D1308 ASTM F710
	VOC levels	50g / liter	EPA, SCAQMD Method 24
	Relative Humidity	Tolerant to 100% RH exposure	ASTM F2170
	Concrete adhesion	(10% of compressive concrete design strength as herein listed) psi min.	ASTM D4541 & D7234
Adhesion to concrete	Cohesive pull off adhesion	359 psi or 100% substrate failure	ASTM D4541 ASTM D7234
Interior room conditions –	Temperature during treatment	45-90 degrees for a 24 hour period before and after	ASTM F1869

during topical treatment application	Cured time	24 hours at 70 degrees F, min. unless more restrictive by specific product mfgr.	
	Humidity	Less than 60%RH	
Refer to drawings and as herein specified			

C. Construction Testing by Others:

Item	Name of Test	Performance Results	Testing Std.
Concrete Floor Slab substrate	Calcium chloride vapor emissions	Not to exceed 3.0lbs	ASTM F1869
	Concrete pH levels	Not to exceed 9.0pH	
	Relative humidity of concrete substrate	Not to exceed 75%RH	ASTM F2170
Adhesion of topical treatment	Cohesive adhesion	Pass at 100% concrete failure	ASTM D4541 & D7234

Test entire floor areas.

- All concrete floors shall be tested in accordance with listed standards and as herein specified.
- Testing shall be done per manufacturer's recommendations.
- Testing shall be done by an independent testing lab hired by General Contractor
- Install and test in compliance with herein listed ASTM standards
 - Three (3) test kits are required in areas up to 1,000 square feet to be evenly spaced throughout the initial 1000 sq. ft. area.
 - One (1) additional test kit for each additional 1,000 square feet thereafter shall be used.
- Levels exceeding the values herein listed shall require remedial floor treatment to bring PH, relative humidity and Vapor emissions levels within allowing levels.

Provide testing report to the Architect and Owner including, but not limited to the following:

- Provide written Test Report for the slab area tested, report shall include Slab Vapor Emission, relative humidity, pH and Adhesion results.
 - All testing locations shall be indicated on a full size floor plan drawing for all floors and listed in numerical order.
 - All testing results shall be written in permanent black marker on the concrete floor slab at all locations in numerical order to match full size drawing markup.
 - Written documentation of interior temperature and humidity for each location during testing.
 - Name and model of all testing equipment used.
 - Name(s) of personnel performing each test.
 - Digital pictures of prepared test site and installed equipment at each test kit location.
 - Tested results labeled to coincide with full size plans.
- Test results will not be accepted if testing is done when the mechanical HVAC system is not running at required values and environment is not at required temperature and relative humidity levels.

D. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.
 - 1. Warranty/Guarantee
 - a. Manufacturers letter authorizing project warranty period
 - 2. Provide current ASTM laboratory testing third party reports for all listed and applicable ASTM standards
 - a. Third party testing information and drawings with testing results as herein specified
 - 3. Field Acceptance: Written acceptance of onsite conditions for specified system installation
 - 4. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.
 - 5. Treatment:
 - a. System: Descriptive literature / product data and installation details.
 - b. Safety information: Current material data safety sheets
 - c. Submit method for cleaning and bead blasting surface of concrete for treatment.
 - d. Standard product data sheets and testing reports as it will appear when issued upon completion of work, demonstrating compliance with this section.
 - e. Provide a letter from manufacturer's full time installation supervisor accepting and warranting installer's workmanship and that criteria of this section has been met.
- E. Submit samples.
 - 1. Not applicable
- F. Certification:
 - 1. Manufacturer's Product Liability Insurance Certificate

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer:
 - 1. Manufacturer's trained personal shall have a minimum of **five (5)** years installation experience of the specific herein listed concrete emission and pH control treatments.
 - a. Provide list of 5 projects of similar size and complexity that have been completed for a period of four (4) years and performing to required standards.

- b. Provide project references consisting of **Owner**, installer, **General Contractor**, contact information, vapor emission levels encountered and date completed.
 2. Performance Guarantee: Refer to GUARANTEE / WARRANTY heading.
 3. Install and test per manufacturer's written instructions and in strict accordance with listed and applicable ASTM standards.
- C. Manufacturer:
 1. Shall have a minimum of **five (5)** years producing vapor emission and pH control systems.
 2. Provide full time on site technical supervision during all installations.
 3. Provide warranty as herein listed.
 4. Provide performance references of **five (5)** successful projects that are a minimum of **two (2)** years of age.
- D. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid.
- E. Stipulations:
 1. Testing Contractor:
 - a. Testing shall be performed by an independent testing agencies that is not associated with the slab installer or any of the flooring installers and/or flooring manufacturers & in accordance with ASTM standards.
 - b. Retesting done after all applications until specified levels is achieved.
 2. Products:
 - a. Shall be directly compatible with products to be installed on top of it including;
 - 1) Flooring adhesives
 - 2) Thin sets
 - 3) Mortar beds
 - 4) Cement overlayments for floor surface smoothing.
 3. Regulatory requirements: Materials and equipment used for this project shall comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).
 4. Treatment shall be placed over exposed cast-in-Place concrete, not over any floor leveling products.
 5. Treatment shall not be placed over any gypsum materials.
 6. Contractor shall determine if floor slab is a Porous slab or non-porous slab.
 7. Product used shall be able per their specifications accommodate the tested vapor admission rate, otherwise an alternate product as herein specified shall be used.

- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
1. Agenda for meeting shall include, but not be limited to;
 - a. How testing is done
 - b. Where testing shall be done
 - c. What area's do and do not require testing
 - d. Schedule of work
 - e. Review of the testing methods.
 - f. Documentation of testing
 - g. Treatment manufacturer's observations and acceptance of site and treatment.
 2. **General Contractor** shall request meeting 35 days in advance of scheduled finish flooring installation.
- G. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during testing and treatment to review procedures.
1. Manufacturer shall review and accept all testing prior to product installation.
 2. Manufacturer's representative shall review and observe all phases of construction to accept the site and complete work meets specification requirements for warranted installation.
- H. Miscellaneous criteria:
1. Test results will not be accepted if testing is done when the mechanical HVAC system is not running at required values and environment is not at required temperature and relative humidity levels.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Store materials in a dry, cool location.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
 1. Field-verify that concrete slabs have cured sufficiently for testing and for treatments.
- B. Building Enclosure and Environment Limitations:
 1. Building to be conditioned as described within ASTM standards.
 2. Space must be fully enclosed with permanent HVAC in operation.
- C. Surface conditions:
 1. Do not apply system when water is accumulated on the surface of concrete.

2. Do not install over any gypsum materials.
3. Self-leveling material shall be 100% cement based and have a compressive value of 4,100 psi as approved by Remedial Treatment manufacturer and installed on top of treatment at a nominal 1/4" thickness.
 - a. Refer to Section 03 00 61 – Concrete Floor Leveling, Patching and Grouting – Cementitious

D. Room conditions:

1. Do not apply system when room temperature is less than 50 degrees F and humidity exceeds 55% RH.
 - a. Provide continuous air movement in room during treatment.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional warranties as indicated below agreeing to repair and/or replace remedial treatment work and the applied finish flooring material which has failed as a result of defects in materials or workmanship of remedial treatment.
 1. Manufacturer's Installation Warranty:
 - a. Manufacturer to provide a standard installation warranty covering installer's installation workmanship and treatment of concrete slab to maintain the values as herein listed for both the Vapor Emissions and the alkalinity levels for a period of **Ten (10)** years starting from the date of Substantial Completion.
 - 1) In the event of treatment failure by concrete cohesive failure, concrete originated vapor emission, in concrete relative humidity and alkalinity (pH), manufacturer and installer shall provide materials and installation labor for replacement of remedial treatment and then the destroyed flooring system at no charge to the **Owner**.
 - 2) The warranty will cover re-testing and new treatment of the floor slab to bring levels back into those herein listed.
 - b. Warrants covering manufacturing defects
 - c. Does not exclude concrete cohesive failure unless surface is plagued by an (ASR) Alkali-Silica Reaction and/or Alkali-Aggregate Reaction (AAR) issue.

2. Manufacturer's Product Liability Insurance Certificate:

- a. Manufacturer shall provide evidence of a product liability insurance policy. Insurer shall have no less than an "A" rating from one of the four major rating services. A certificate of insurance shall be delivered to the **Owner** and shall name the **Owner**, **Architect** and **General Contractor** as co-insured.
 - b. Warrants covering manufacturing defects
 - c. Does not exclude concrete cohesive failure unless surface is plagued by an (ASR) Alkali-Silica Reaction and/or Alkali-Aggregate Reaction (AAR) issue.
- D. Warranty exclusions shall be limited to:
1. Topical flooding over finish flooring that destroys adhesion of finish flooring to substrate.
 2. Treatment damage from flooring demolition or removal.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
1. Concrete floor slab curing
 2. Floor leveling treatment
 3. Finish flooring
- B. Related sections include, but are not limited to the following:
1. Division 1
 2. Section 03 30 00 – Cast-in-Place Concrete
 3. Section 03 00 61 – Concrete Floor Leveling, Patching and Grouting – Cementitious
 4. Division 9 Finish Flooring Sections

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
1. Complete instructions regarding maintenance of the treatment, materials, finish, etc.
 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing and remedial treatment with curing of concrete and installation of finish flooring.
1. Schedule testing far enough in advance of flooring installation to provide ample time to install remedial treatment of slab, test, and re-treat as required.

1.13 TESTING AGENT

- A. Refer to Division 1 for Testing Laboratory service requirements

- B. Independent testing lab to test vapor emission and alkalinity levels before and after treatment and continually until acceptable levels are met.

- 1. Refer to Testing under Part 3 of this specification

1.14 GENERAL SYSTEM DESCRIPTION

- A. Test concrete slabs as herein specified.
- B. Slab treatment:
 - 1. Shot blast
 - 2. Vacuum and pre-dampen surface
 - 3. Treatment installation
 - 4. Primers
 - 5. Cement topcoat
 - 6. Cementitious floor leveling by others as required.
 - a. Refer to Section 03 00 61 – Concrete Floor Leveling, Patching and Grouting – Cementitious
- C. Retest slabs to determine if more treatment is required.
- D. Retreat and test until specified values are met.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturer shall be one of the following and as herein listed and in Drawings:
 - 1. Treatment:
 - a. Synthetics, Intl. www.syntheticsintl.com
 - b. MaiPei, www.maipei.com/us-en
 - c. Koster, www.kosterusa.com/us_en
 - 2. Testing equipment:
 - a. American Moisture Test, www.americanmoisturetest.com
 - 3. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.

- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS - TESTING

A. **Concrete Testing:**

- 1. Application: Test concrete slabs, typically at all conditions
- 2. Products:

a. **Concrete Moisture Vapor Test Kit:**

- 1) Product:
 - a) Mfgr: American Moisture Test, Inc., www.americanmoisturetest.com
 - b) Product: AMT Dome Test
 - c) Method: Anhydrous Calcium Chloride
 - d) Limitations: Typical
 - e) Notes: Conduct test on the slab in the environment that closely matches that of which the finish-flooring environment will be in.

b. **Alkalinity Test Kits (pH)**

- 1) Application: Test concrete slab typical at all conditions and in conjunction with Vapor Emission tests.
- 2) Product:
 - a) Mfgr: American Moisture Test, Inc., www.americanmoisturetest.com
 - b) Product: Factory pre-calibrated probes, RH probe accuracy of 2%-3%
 - c) Notes: Factory pre-calibrated probes, RH probe accuracy of 2%-3%

c. **Relative Humidity Emission Test Kits:**

- 1) Application: Test concrete slab typically at all conditions
- 2) Product:
 - a) Mfgr: American Moisture Test, Inc., www.americanmoisturetest.com
 - b) Product: RH test
 - c) Method: In-Situ Relative Humidity
 - d) Limitations: Typical

2.3 MATERIALS – REMEDIAL TREATMENT

A. Moisture and Alkalinity Treatment Schedule, materials and components:

1. General:

- a. Application: Typical all conditions when slab does not meet vapor emission, relative humidity, and/or alkalinity levels, and as directed by **Architect**, no exception taken.

2. Remedial Treatment Schedule:

a. Synthetics International:

1) Schedule:

- a) Slab tests up to 20 lbs or less and up to 100% relative humidity:
 - i. Mfgr: Synthetics International
 - ii. Product: Synthetic 30 – factory mixed
 - a. Restricts 30 lbs of vapor per ASTM F1869
 - b. Controls 14pH alkalinity per ASTM F710
 - c. Tolerant to 100% RH per ASTM F2170
 - iii. Components: Two & water reducible epoxy
 - iv. Coats: Two, min.
 - v. Slab Preparation: Shotblast per manufacturer's recommendations
 - vi. Performance: As herein specified
 - vii. Standards: As herein specified
 - viii. Recoat time: Per manufacturer's standards
 - ix. Foot traffic time: Per manufacturer's standards

b. Alternate 1:

1) Slab tests at 20 lbs or less and up to 100% relative humidity:

- a) Mfgr: Koster
- b) Product: VAP I® 2000 Zero VOC
- a. Components: Two-component, epoxy resin
- c) Coats: One, min.
- d) Slab Preparation: Shotblast per manufacturer's recommendations
- e) Performance: As herein specified
- f) Standards: As herein specified
- g) Recoat time: Per manufacturers standards
- h) Foot traffic time: Per manufacturer's standards

c. Alternate 2:

- 1) Slab tests at 20 lbs or less and up to 100% relative humidity:
 - a) Mfgr: MaiPei
 - b) Product: Planiseal EMB
 - c) Components: Two-component, epoxy
 - d) Slab Preparation: Shotblast per manufacturer's recommendations
 - e) Application Thickness: One coat, min., 18 mil. Min.
 - f) Performance: As herein specified
 - g) Standards: As herein specified
 - h) Recoat time: Per manufacturer standards
 - i) Foot traffic time: Per manufacturer standards

3. Remedial treatment surfacing:

- a. Application: Install over remedial treatment per treatment manufacturer's recommendations
 - 1) Cement Top coat:
 - a) Refer to Section 03 00 61 – Concrete Floor Leveling, Patching and Grouting – Cementitious

4. Remedial treatment primers and floor leveling materials:

- a. Application: Install primers and/or cementitious floor leveling materials over remedial vapor emission and alkalinity control treatment per treatment manufacturer's recommendations
 - 1) Refer to Section 03 00 61 – Concrete Floor Leveling, Patching and Grouting – Cementitious

2.4 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.
- B. Leveling cement in accordance with treatment manufacturer's requirements and Section 03 00 61 – Concrete Floor Leveling, Patching and Grouting – Cementitious
 1. Coordinate with finish flooring materials for compatibility with surface finish of treatment.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
 1. Examine areas and conditions under which work is to be performed.

2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

C. Treatment shall be installed in all areas not meeting herein specified criteria.

3.2 COORDINATION

A. Refer to Division 1 for project coordination requirements.

- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

A. Prepare work, substrates, etc. in accordance with material treatment criteria.

- B. Prior to installation, mask or otherwise protect all walls, equipment and other items from the effects of shot blasting and application.

C. Diamond Grind, Shot blast, sand or scarify concrete surface to insure bonding of remedial treatment to concrete in accordance with manufacturer's written instructions.

1. Shot blast surfaces using #390 to #420 shot to insure remedial treatment penetration into concrete.

2. Diamond grind near wall base, edges and columns.

D. Sweep, broom and vacuum all surfaces to control dust and possible treatment contamination.

E. Treat all cracks, control joints as required for a warranted assembly.

F. Clean and fill all divots, chips voids and other surface irregularities with Portland based cementitious fill only after remedial treatment application is complete.

1. Gypsum based materials are not acceptable under any circumstances.

3.4 INSTALLATION

A. General:

1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.

B. Prepare concrete surface and apply treatment system in accordance with manufacturer's instructions for a warranted system.

1. Maintain air movement and ventilation during process by using box and floor fans in accordance with floor treatment manufacturer.

C. Provide remedial treatment system as a final finishing surface in all areas except:

1. As indicated in documents

D. Treatment:

1. Treat all floors which exceed the specified limits of either Vapor emissions and/or Alkalinity.
2. Install product over CIP concrete and into all cracks and joints.
3. Install per manufacturer's written instructions and in strict accordance with indicated and required ASTM standards.
 - a. Provide written documentation of interior temperature and humidity during testing
 - b. Provide digital pictures of prepared test site and installed equipment
 - c. Provide name of testing equipment
 - d. Provide name(s) of personnel performing tests
 - e. Provide topical treatment manufacturers acceptance letter for testing and treatment to meet warranty and insurance criteria.
4. Retreat all areas that fail testing until said testing shows compliance with specified levels.

3.5 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 1. The Applicator shall be responsible for the proper application of the materials.
- B. Pre-flooring Installation:
 1. Conduct testing of on the slab prior to finish flooring installation and after mechanical HVAC system is operating so the environment closely matches that of which the finish-flooring environment will be in.
 2. Testing shall be performed in accordance with listed and applicable ASTM standards.
- C. After Slab Treatment – Compliance Testing:
 1. After remedial treatment is done, test floor in the same locations as initial test to ensure that levels are attained for maximum Vapor Emissions, pH and adhesion.
 2. Retreat all areas that fail and retest until levels are met.
 3. Retest and retreat until levels are achieved.

3.6 CONCRETE TESTING (TYPICAL)

- A. Testing:
 1. Initial:
 - a. Install and test all concrete slabs / all levels:
 - 1) 1st:
 - a) Porous slab or non-porous concrete
 - 2) 2nd.

- a) Vapor Emission
 - b) Humidity
 - c) Ph
 - b. Install and test per manufacturer's written instructions and in strict accordance with listed ASTM standards.
 - 1) Provide written Test Report for the slab area tested.
 - 2) Testing shall be done per manufacturer's recommendations and coordinated with this Section.
 - a) A shop drawing shall be submitted identifying the locations for all the test kits, values and numerically listed.
 - i. This drawing shall be used for Compliance testing after remedial treatment is complete.
 - b) Floor slab shall be marked in permanent black marker for tested values and numerically noted to match full size drawing with testing locations documented.
 - 3) Interior temperature and humidity during testing
 - 4) Digital pictures of prepared test site and installed equipment
 - 5) Name of testing equipment
 - 6) Personnel performing tests.
2. Schedule:
- a. 1st Testing
 - 1) Testing contractor shall coordinate with **General Contractor** and each flooring contractor to make determination if floor is considered a Porous or Non-Porous concrete slab.
 - b. 2nd Testing:
 - 1) 1) Moisture vapor:
 - a) Testing will be performed using prepackaged calcium chloride dome test kits according to following test schedule.
 - i. Use minimum of 3 kits for area up to 1,000 square feet.
 - a. Use additional test kit for each additional 1,000 square feet or portion thereof.
 - ii. Place tests a minimum of 5 feet from exterior walls and away from UV light.
 - iii. Mark each test location and number on the concrete surface using a marker and submit each test location on a reduced floor plan.
 - iv. Calculate test results and expressed in pounds of moisture vapor emitted per 24 hours in 1,000 square foot area.

- b) pH:
 - i. Digital Alkalinity-pH testing:
 - a. Directly within moisture dome area, apply a 1 inch x 1 inch amount of water and allow to soak into surface for 60 seconds.
 - b. Expose flat tip meter to water and allow to calculate pH level for 10 seconds.
 - c. Document pH reading.
 - c) Humidity:
 - i. In-Situ Relative Humidity testing:
 - a. When installing moisture vapor tests, prepare each relative humidity test location adjacent to the calcium chloride test locations.
 - b. Using a 5/8 inch drill bit, drill into concrete to the required depth.
 - c. Vacuum and blow out debris.
 - d. Install manufacturer provided plastic sleeves and air tight cap.
 - e. After 72 hours of acclimation, expose RH probe and allow to acclimate for 30 minutes.
 - f. Document the RH readings, temperature and required data for review.
- c. Submit all test results, locations and flooring tolerance to **Owner and Architect.**

3.7 CONCRETE TREATMENT (TYPICAL)

A. Treatment:

1. Proceed with vapor reduction system in areas exceeding the following:
 - a. Maximum level shall not exceed: 3.0 pounds/ 9.0pH/ 75% RH
 - b. Treat all floors which exceed the specified limits in Vapor and pH.
 - 1) At a minimum the entire room within the wall boundaries where a Vapor emissions test and/or a pH test exceeds the maximum levels shall be treated
 - c. Install per manufacturer's written instructions and in strict accordance with ASTM standards.
2. Provide written documentation of all testing and conditions.
 - a. Interior temperature and humidity during testing
 - b. Digital pictures of prepared test site and installed equipment
 - c. Name of testing equipment
 - d. Personnel performing tests

3.8 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's** NOTICE of "Certificate of Substantial Completion".

END OF SECTION 07 28 00

SECTION 07 62 00 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Flashing
 - 2. Transition flashing
 - 3. Copings
 - 4. Perimeter edge flashing
 - 5. Gutters and Downspout assemblies

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. Aluminum Association (AA), www.aluminum.org
- E. American Architectural Manufacturers Association (AAMA), www.aamanet.org
- F. American Society For Testing and Materials (ASTM), www.astm.org
- G. American National Standards Institute (ANSI), www.ansi.org American Welding Society (AWS), www.aws.org
- H. American Society of Mechanical Engineers (ASME) www.asme.org
- I. American Welding Society (AWS), www.aws.org National Coil Coating Association, www.coilcoating.org
- J. National Coil Coating Association, www.coilcoating.org
- K. Sealant, Waterproofing and Restoration Institute (SWRI), www.swrionline.org

- L. Sheet Metal and Air Conditioning Contractors, Association (SMACNA), www.smacna.org

1. Architectural Sheet Metal Manual

1.3 PERFORMANCE, TESTING AND INSPECTION

A. **General:**

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Testing shall be done as herein specified and as listed in drawings.
5. Refer to Division 1 for additional requirements for DSA projects.

B. **Standards:**

Item	Name of Test	Performance	Testing Std.
Flashing - premanufactured	Installation	Comply	Specific manufacturers recommendations
Flashing – custom shapes	Installation	Comply	SMACNA and as detailed, comply with most restrictive
Refer to drawings and as herein specified			

C. **Sustainability:**

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. **Construction Monitoring/Observations by others:**

Item	Name of Test	Performance Results	By Whom
Pre-manufactured Copings	Installation compliance	Comply	Manufacturer's representative
Flashing	Waste and recycling	Comply	Refer to Division 1 for construction waste management and disposal/recycling requirements

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.
 1. Data:

- a. Manufacturers data for each specific pre-manufactured flashing components
- b. Fasteners
- c. Sealants
- d. Adhesives
- 2. Shop Drawings;
 - a. Provide detailing with all dimensions and field verified dimensions and indicate on all these the applicable detail number from contract documents.
 - 1) Illustrating the following, but not limited to:
 - a) Layout, joining, profiles, expansion joints and anchorage of fabricated work
 - b) Layout, joining, profiles, expansion joints and anchorage of pre-manufactured components, copings, etc.
 - c) Boot flashing
 - d) Counter-flashings, trim/fascia units
 - e) Wall to coping transition boot flashing assemblies
 - f) Gutters, downspouts, and expansion joint systems with related calculations indicating required gutter design.
 - b. All details shall be a minimum of 3" = 1'-0" scale
 - c. All plan layouts shall be at 1" = 1'-0" scale
 - d. Details shall be at numbered and referenced to match Architectural details.
- E. Submit samples.
 - 1. Soldered boot flashing to illustrate welding
- F. Site mock-up, refer to "Mock-Up" heading.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor /Installer/Fabricator shall have been in business for **five (5)** years minimum providing/installing/finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 - 1. Agenda for meeting shall include, but not be limited to;
 - a. Copings

- b. Roof flashing and counter flashing
 - c. Boot flashings, i.e. wall to roof, wall to coping, etc.
- E. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the pre-manufactured copings, etc. on-site periodically during installation work to review installation procedures.
 - 1. Manufacturer's representative shall review and provide written review that work meets specification requirements.
 - 2. Written reviews shall be sent to the **Architect** by the manufacturer's representative.
- F. Miscellaneous criteria:
 - 1. All work shall conform to the recommended practices of the most current adopted edition of the Architectural Sheet Metal Manual by SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc) and details whichever is most restrictive.
 - 2. Oil – Canning in excess of that allowed by SMACNA is not acceptable, and all conditions shall be replaced and/or repaired prior to completion & review for acceptance.
 - 3. All flashing conditions in direct contact with roofing material shall have homogeneous soldered seams, typical.
 - 4. Fabricator shall be qualified fabricator whose work is in compliance with SMACNA guidelines and specifications as herein specified and in Drawings

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial one (1) year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.

1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional [five] (5) year warranty agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- D. Furnish installing contractors additional [five] (5) year warranty agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 1. Roofing
 2. Walls
 3. Openings
- B. Related Sections include, but are not limited to the following:
 1. Division 1
 2. Section 02 41 19 – Selective Building Demolition & Protection
 3. Section 05 50 00 – Metal Fabrications
 4. Section 06 10 00 – Rough Carpentry
 5. Section 07 92 00 – Sealants and Caulking
 6. Section 08 11 13 – Steel Doors & Frames
 7. Section 09 29 00 – Gypsum Board & Sheathing Substrates
 8. Section 09 90 00 – Paintings & Coatings
- C. Related Documents include, but are not limited to the following:
 1. Division 1 Supplementary Conditions

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. Schedule work and sequence with other trades affected or affecting work under this specification.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS/FABRICATORS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as listed herein and in Drawings:
 - 1. Pre-manufactured copings, flashings, etc:
 - a. Fry Reglet, www.fryreglet.com
 - b. SBC Industries, Roof flashings, www.sbcflashings.com
 - c. Metal-Era, www.metalera.com
 - d. Lane-Aire Manufacturing Corp., www.lane-aire.com
 - 2. Pre-manufactured Gutters:
 - a. Perimeter Systems (SAF), www.saf.com/persys, 866.660-6627
 - b. Metal-Era, www.metalera.com
 - 3. Flashing
 - a. Refer to documents and as herein specified.
 - 4. Fasteners:
 - a. Steeler, Inc., www.steeler.com
 - 5. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. General:

1. Zinc-Coated Steel: Commercial quality with 0.20% copper, ASTM A 525 except ASTM A 527 for lock forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0239" thick (24 gage) except as otherwise indicated.
2. Metal Accessories:
 - a. Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed non-corrosive, size and gage required for performance.
 - b. Solder: ASTM B32, Class A1
 - c. Flux: Muriatic acid. Asphaltic primer: ASTM D41
3. General Accessories:
 - a. Plastic cement: Asphaltic, FS SS-C-153, Type I
 - b. Sealant: Refer to Section 07 92 00
4. Flashing Reglets:
 - a. Comply with flashing requirements: Gauge as required by SMACNA.
 - b. Flashing:
 - 1) Galvanized Steel: 22 gauge min. and as required by SMACNA
 - a) 16GA at gutter straps
 - c. Waterproof membrane – spray applied:
 - 1) Material: Spray-applied waterproof membrane
 - d. Refer to Section 07 13 26 – Cold Applied Self-Adhering Membrane (CASAM)
 - e. Isolation membrane / Slip Sheet:
 - 1) Material: 4lb. Rosin paper
 - 2) Manufacturer: Atlas
 - 3) Product: FR-50
 - f. Gutters, Straps, Brackets, etc.:
 - 1) Comply with SMACNA guidelines
 - 2) Shop fabricate all items where a gauge is required that is not available pre-manufactured.

B. Schedule:

1. **Flashing**

- a. General:

- 1) Flashing typically shall be designed and installed as herein specified, and indicated on Drawings unless noted and/or specified otherwise.
 - 2) Flashing shall typically be provided under this specification section, unless noted and/or specified otherwise.
 - 3) Flashing shall be repaired prior to finishing.
 - 4) Flashing shall be prepared to be painted.
- b. Rough Carpentry – Section 06 10 00:
- 1) Wood beams, outriggers, etc.: (Structural and non-structural)
 - a) Full span sheet metal cap with soldered watertight seams at top portion of all exterior exposed beams with return sides.
 - b) Flashing typically shall be designed and installed as herein specified, and indicated on Drawings unless noted and/or specified otherwise.
 - c) Flashing shall typically be provided under this specification section, unless noted and/or specified otherwise.
- c. As indicated in documents and in details.
- 1) Refer to drawings
 - 2) Reglet & skirt flashing to cover single ply surface applied at walls
 - a) Mfgr: Fry Reglet
 - b) Model: SM
 - i. Refer to Schedule as herein specified for other models for different conditions
 - c) Components – two part
 - i. Reglet
 - ii. Skirt flashing
 - iii. Prefabricated inside & outside corners
 - iv. fasteners
 - d) Finish: Painted
 - i. Factory applied Kynar 500/Hylar 500 finish
 - ii. Color: TBD
 - e) Material: Galvanized Steel
2. Wall penetration flashing, window & door flashing & counterflashing
- a. General:

- 1) Flashing typically shall be designed and installed as herein specified, and indicated on Drawings unless noted and/or specified otherwise.
 - 2) Flashing shall typically be provided under this specification section, unless noted and/or specified otherwise.
- b. As indicated in documents and in details.
3. Waterproof Membrane
 - a. Shall be provided and installed by who is responsible for the specific components; Gutters and Downspouts, Copings, etc.
 - b. **General Contractor** will need to coordinate products and application of membranes.
4. Fasteners/Soldering
 - a. General:
 - 1) Fasteners typically shall be installed as herein specified, and indicated on Drawings unless noted and/or specified otherwise.
 - 2) Fasteners shall typically be provided under this specification section, unless noted and/or specified otherwise.
 - 3) Fasteners shall be compatible with all material they penetrate and/or come in contact with.
 - b. Fasteners shall be provided by and installed under the scope of work as herein listed.
 - c. Solder where indicated and when required by assembly.
5. Reglets and skirt flashing
 - a. General:
 - 1) Reglet is manufactured for specific wall condition.
 - 2) Snap in Skirt Flashing is designed to snap into reglet and supplied with Reglet as an assembly.
 - a) Two component assembly & supplied as such.

2.3 SCHEDULE

- A. General:
 1. Flashing type shall be compatible with metals that it is in contact with and installed to eliminate galvanic corrosion.
 2. Flashing shall match finish of adjacent metal, U.N.O.
 3. Coordinate material, finish and color with wall, roof and parapet conditions.
 4. Dissimilar materials shall be isolated from each other.
- B. Material Types:

1. Flashing, u.n.o.
2. Typical, u.n.o.: Galvanized Steel
3. Built-up Roofing: Galvanized Steel
4. Control and expansion joints, refer to Section 09 24 00 – Portland Cement Plastering
5. Wood Siding: Galvanized Steel
6. Preformed Metal Siding: Preformed metal siding material
7. Aluminum Composite Panel System: Aluminum Composite material
8. Specific conditions not included in a specific associated Specification Section: as noted
9. Gutters and Downspouts
10. Material:
 - a. Galvanized Steel: Typical unless herein scheduled otherwise and/or required by roofing and/or siding manufacturer.
11. Material Gauge / thickness:
 - a. Comply with SMACNA requirements.
12. Coping
13. Galvanized Steel: Typical unless herein scheduled otherwise and/or required by roofing and/or siding manufacturer
14. Copper: Copper roofing and/or copper siding
15. Zinalume: Zinalume roofing and/or siding
16. Aluminum: Aluminum
17. Aluminum Windows: Aluminum

C. Fasteners:

1. Install type as approved by product manufacturer whose material is being fastened through and material type that is compatible with flashing and other materials which fastener comes in contact with.
2. Exposed conditions, fasteners shall include neoprene washers, typical.
3. Solder in accordance with materials requirements.

PART 3 - EXECUTION

3.1 INSPECTION/EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.

2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- C. Coordinate application of all flexible waterproof membrane flashings
 1. Refer to Section 07 13 26 – Cold Applied Self-Adhering Waterproof Membrane

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 FABRICATION

- A. General:
 1. Fabricate in compliance with SMACNA guidelines and contract documents
 - a. Most restrictive shall govern
- B. Assemblies:
 1. Flashings and counter flashings:
 - a. Install wherever detailed and as necessary to make building watertight. Lap joints at least 6 inches and fill with sealant. Coordinate installation with other trades involved. Attach with material compatible screws, neoprene washers and cap with bead of sealant.
 2. Caps and closures:
 - a. Provide miscellaneous caps and closures; profiles and gauges as shown on Drawings.
 3. Expansion joints:
 - a. Per SMACNA Standards.
 - b. Locate per SMACNA standards & details. (Coordinate with joints indicated on documents.)
 4. All flashing and counterflashing at inside & outside corners shall be continuously soldered for watertight assembly.
 - a. At pre-manufactured assemblies such as Transition Flashing, the specified two piece 'Springlok' - Reglet and snap in skirt flashing, shall be installed with manufacturers pre-manufactured inside and outside corners.
 5. Lead flashing

- a. Shall be coated with a bituminous coating prior to direct contact with uncured concrete or mortar.
6. All connections to lead shall be soldered.
 - a. Soldering:
 - 1) Use appropriate flux and solder
 - 2) Neutralize flux after soldering
7. Waterproof flexible flashings and membranes
 - a. Cold-applied self-adhering waterproof membrane shall be installed in accordance with manufacturer's instructions.
 - b. Install membrane in shiplap fashion such that membrane overlaps substrate barrier material.
 - c. Insure that Waterproof Membrane is compatible with other materials it comes in contact with and notify Architect of any compatibility problems.
 - d. Insulate, separate sheet metal work and install approved fasteners that will be in contact with dissimilar metals or other material that would produce electrolytic action.

3.5 MOCK-UP

- A. Erect at location approved by **Architect**.
 1. Mock-up shall not be part of final construction once approved by **Architect**.
 - a. When approved by **Architect** some mock-ups can be part of final construction
 2. Mock-up shall comprise of all components and finishes as specified and indicated in Drawings.

3.6 INSTALLATION

- A. General:
 1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 2. Fabricate in compliance with SMACA guidelines and contract documents.
 - a. Most restrictive shall govern
- B. Workmanship
 1. Specifications herein are minimum required; provide such extra materials and workmanship as necessary to obtain required results. Install work in accordance with recognized standards and best trade practices.
 2. Finish shapes true and straight as shown or as required to match existing adjoining sheet metal.
 3. Where members intersect each other, cope to precise fit and securely solder; solder slowly with well-heated coppers; neat and with full flowing joints; thoroughly clean materials at joints before soldering; scrape exposed soldering on finished surfaces smooth; make lock seam work flat and true to line and sweated full of solder; thoroughly wash acid fluxed work with soap suds and water solution after soldering.

4. Install sheet metal work to provide allowances for expansion and contraction and weather tightness throughout and as hereinafter specified.
5. Clean and coat with asphaltic primer all surfaces that will be in contact with roofing materials or that will not be exposed after installation.
6. Allow to dry thoroughly before installation.
7. Touch up painting
 - a. Where new or existing galvanizing is damaged by fabrication or installation, repair surfaces with "Galvalloy" or "Galweldalloy," or Zincalume compatible material, applying in accordance with manufacturer's printed directions.
 - 1) Float full, grind, and buff smooth.
 - b. Touch up material shall be compatible with substrate.

3.7 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.
- C. Touch up:
 1. Where new or existing galvanizing is damaged by fabrication or installation, repair surfaces with "Galvalloy" or "Galweldalloy," or Zincalume compatible material, applying in accordance with manufacturer's printed directions. Float full, grind, and buff smooth.
 2. Touch up material shall be compatible with substrate.

3.8 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.

- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 07 62 00

SECTION 07 65 26 - SELF ADHERING SHEET FLASHING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes: Self adhering waterproofing membrane and primer to provide moisture protection in masonry cavity wall construction and frame construction.
 - 1. REFERENCES
 - a. ASTM E96 – Test Methods for Water Transmission of Materials
 - b. ASTM D412 – Test Methods for Vulcanized Rubber And Thermoplastic Rubbers and Thermoplastic Elastomers – Tension
 - c. ASTM D903 – Peel or Stripping Strength of Adhesive Bonds
 - 2. SUBMITTALS
 - a. Provide in accordance with Section 01330- Submittal Procedures
 - 1) Product Data and Installation Instructions
 - 2) (MSDS) Material Safety Data Sheets
 - 3) 2 inch by 2 inch minimum membrane sample
 - 3. PRODUCT HANDLING
 - a. Storage - Protect product from inclement weather or excessive heat
 - b. Temperature not to exceed 150 degrees or go below 25 degrees Fahrenheit

PARTS 2 – PRODUCTS

- 1. ACCEPTABLE MANUFACTURERS
 - a. CLARK/HAMMERBEAM Corp., PO Box 381, Dedham, MA 02027; Tel/781-461-1946; www.fiberwebflashing.com
 - b. Manufacturers of equivalent products submitted and approved in accordance with Section 01 25 00-Substitution Procedures
- 2. PRODUCTS
 - a. A self-adhering waterproofing membrane with a siliconized release liner; AQUA FLASH GREEN as manufactured by FIBERWEB Div. CLARK- HAMMERBEAM Corp.
 - 1) Composition: a clear, VOC free adhesive bonded to a 30% recycled post-industrial woven and coated industrial film
 - 2) Total thickness: 40 mils
 - 3) Widths: 12", 16", 18", 24", 36" (select appropriate width)
 - 4) Ultra Violet Exposure: 2,000 hrs. – no change
 - 5) Peel Adhesion of Adhesive Bonds: 10.25 lbs.lf/in. in accordance with ASTM D903
 - 6) Moisture Vapor Transmission: .02 grains max/sq.ft./hr. in HG in accordance with ASTM E96
 - 7) Bursting Strength: 383 psi in accordance with ASTM D-751
 - 8) Elongation: 30% in accordance with ASTM D412C

- 9) Tensile Strength (Grab): 205 lbs in accordance with ASTM D-751
- b. Primer: To be used for substrate preparation as recommended by waterproofing membrane manufacturer

PART 3 - **EXECUTION**

3.01 INSPECTION

- a. Concrete substrate must be fully cured prior to membrane application
- b. Substrate is to be reasonably smooth, free from any loose material, debris, oils and is to be completely dry

3.02 PREPARATION

- a. Prepare substrate surface in accordance with manufacturer's recommendations
- b. Primer Application
 - a) Follow manufacturer's recommendations

2. MEMBRANE APPLICATION

- a. Cut membrane into 8-10 foot lengths
- b. Remove release liner. Apply membrane starting from the lowest point and work upwards.
- c. All laps are 2 ½" inch minimum
- d. Use a steel hand roller to secure membrane firmly in place eliminating wrinkles and air pockets
- e. Cut membrane flush with outside surface of building when no drip plate is installed
- f. Inside and outside corners must be covered with two layers of membrane and sealed with mastic (see details/drawings)

END OF SECTION 07 65 26

SECTION 07 92 00 – SEALANTS AND CAULKING

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Furnish and install primers, sealant, caulking and back-up material where required, as indicated and as herein specified to provide a weather-tight building, including, but not limited to:
 - a. Sealant joints
 - b. Lap joints
 - c. Troweled sealant bed below thresholds, sill flashings, etc.
 - d. Sealant bed under door thresholds
 - e. Sealant at wall to floor and wall to deck / structure, acoustical and non-acoustical assemblies
 - f. Sealant around all wall penetrations, acoustical and non-acoustical assemblies
 - 2. Furnish and install two side adhesive tapes and primers.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Architectural Manufacturers Association (AAMA)
 - 1. AAMA 850 - Voluntary Specifications and Test Methods for Sealants
- E. American Concrete Institute (ACI)
 - 1. ACI 302.1R - Guide for Concrete Floor and Slab Construction.

F. American Society for Testing and MATERIALS (ASTM):

1. ASTM C412 - Standard Specification for Concrete Drain Tile
2. ASTM C510 - Multi Component Joint Sealants
3. ASTM C603 - Standard Test Method for Extrusion Rate and Application Life of Elastomeric Sealants
4. ASTM C639 - Standard Test Method for Rheological (Flow) Properties of Elastomeric Sealants
5. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer
6. ASTM C719 - Adhesion & Cohesion of Elastomeric Joint Sealants under Cycle Movement
7. ASTM C790 - Guide for Use of Latex Sealants.
8. ASTM C792 - Effects of Heat Aging on Weight Loss, Cracking & Chalking of Elastomeric Sealants
9. ASTM C794 - Adhesion and Peel of Elastomeric Sealants
10. ASTM C804 - Practices for Use of Solvent - Release Type Sealants.
11. ASTM C834 - Specifications for Latex Sealing Compounds.
12. ASTM C881 - Specifications for Epoxy - Resin Bonding Systems for Concrete.
13. ASTM C919 - Practices for Use of Sealants in Acoustical Applications.
14. ASTM C920 - Specification for Elastomeric Joint Sealants.
15. ASTM C1135 - Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants
16. ASTM C1184 - Specification for Structural Sealants.
17. ASTM C1193 - Standard Guide for Use of Joint Sealants.
18. ASTM C1247 - Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids
19. ASTM C1248 - Staining of Porous Substrates by Joint Sealants
20. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
21. ASTM D614 - Tear strength
22. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
23. ASTM D1149 - Standard Test Method for Rubber Deterioration-Surface Ozone Cracking in a Chamber
24. ASTM D1850 - Specification for Concrete Joint Sealer Cold-Application Type

- 25. ASTM D2240 - Standard Test Method for Rubber Property - Durometer Hardness
- 26. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
- 27. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials

G. Federal Specifications (FS):

- 1. SS-S-200E Sealants, joint, Two - Component, Jet - Blast - Resistant, Cold - Applied, for Portland Cement Paving
- 2. TT-S-001657 Sealing Compound: Single Component, Butyl Rubber Based, Solvent Release Type (For Buildings and Other Types of Construction)
- 3. TT-S-00227E All multi-component, cold applied formulations for sealing, glazing, etc. in buildings
- 4. TT-S-1543A One-part silicone based cold applied non-sag formulations for sealing, glazing, etc. in buildings

H. Sealant, Waterproofing and Restoration Institute (SWRI) - Sealant and Caulking Guide Specification.
www.swrionline.org

I. Underwriters Laboratories (UL):

- 1. UL 263

J. Dow Corning:

- 1. Technical Manual
- 2. Accelerated Weathering and Heat Stability of Various Perimeter Sealants
- 3. Application and Maintenance Guide, ALLGuard Silicone Elastomeric Coating
- 4. Waterproofing Sealant Guide

K. Laticrete installation instructions and literature for System Warranty assemblies and sealant applications.

1.3 PERFORMANCE, TESTING AND INSPECTION

A. **General:**

- 1. Comply with manufacturer's standards.
- 2. Comply with Building Code.
- 3. Job site inspections shall be done as herein specified and as listed in drawings.
- 4. Testing shall be done as herein specified and as listed in drawings.

B. Refer to Division 1 for additional requirements for DSA projects

C. **Standards:**

Item	Name of Test	Performance	Testing Std.
Sealant	Refer to Materials Heading(s)	Refer to Materials Heading(s)	Refer to Materials Heading(s)
Primers	Refer to Materials Heading(s)	Refer to Materials Heading(s)	Refer to Materials Heading(s)
Refer to drawings and as herein specified			

D. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

E. Construction Monitoring/Observations by others:

Item	Name of Test	Performance Results	By Whom
Sealant and backer rod	Const. Waste Management	Comply	Refer to Division 1 for construction waste management and disposal/recycling requirements

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit the following items for Architect's review; refer to Section 01 33 00 – Submittal Procedures for definitions, specific requirements for each type of submittal, and minimum quantities.
 1. Manufacturer's Product & Technical Data
 2. Manufacturer MSDS Sheets
 3. Manufacturer Installation Instructions
 4. Samples:
 - a. Digital samples will not be accepted for any product requiring color selection by **Architect**.
 - b. When indicate by these specifications, drawings or associated specifications, provide sample of required Custom color for **Architect's** review.

1.5 MOCK-UPS:

- A. Erect an Assembly Mockup at Project site at location acceptable to **Owner** and **Architect**.
 1. Refer to individual specification sections for coordination with other Assembly components.
 2. Refer to Section 01 33 00 – Submittal Procedures for additional information relating to Mock-Ups.

1.6 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.
- C. **Manufacturer** shall have been in business for **ten (10)** years providing/installing/finishing similar size projects and complexity.
- D. Sealants, which come in contact with each other, shall be of same manufacturer and sealant type to ensure that materials, which come in contact with one another, will be compatible. Installer shall supply a letter from the manufacturer certifying the compatibility of all sealants with one another, and with all construction materials with which they will come in contact on the project.
- E. Lead Times:
 - 1. **General Contractor** shall coordinate with supplier to verify product lead times during bids and at award of contract, and account for such lead times in their costs and schedules.
 - 2. **General Contractor** shall provide an itemized list of materials which might have or are confirmed to have a lead time problem and what the anticipated lead time is.
 - 3. **General Contractor** shall certify in writing that all materials have acceptable lead times as they relate to availability for sub-contractor and **General Contractor** to meet construction schedule and sequence of construction.
- F. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid
- G. Stipulations:
 - 1. All work must be installed in accordance with SWRI Guide Specifications and ASTM C1193.
 - 2. Perform acoustical sealant application work in accordance with ASTM C919.
- H. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
Agenda for meeting shall include, but not be limited to;
 - 1. Substrate preparation
 - 2. Colors and where applied
 - 3. Sequence of sealant installation and other paints, sealers, etc.
 - 4. **General Contractor** shall request meeting 5 days in advance of construction.
- I. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation work to review installation procedures. Manufacturer's representative shall review and certify in writing all phases of construction to verify the complete work meets specification requirements.
Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.

J. Miscellaneous criteria:

1. Manufacturer to instruct applicator in procedure for intersecting sealants.
2. Workmanship shall be of the highest quality in accordance with the best practice, an in strict

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Deliver materials in factory sealed containers with manufacturer's original labels attached.

1.8 JOB CONDITIONS

- A. Field verify that all components, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
- B. Do not apply sealants at temperatures below 40°F (4°C) unless additional steps are taken to prevent freezing and frost buildup.
- C. Apply waterproofing, water repellents, and preservatives after application of sealants unless manufacturer's approval is obtained prior to applying sealant.

1.9 PROTECTION

- A. Protect finish surfaces at all times from concrete adjacent to them.
- B. Inspect forming against such work and establish tight leak proof seal before concrete is placed within or against the forming.
- C. Finish work defaced with concrete on surface shall be replaced.
- D. Concrete to be left exposed: Do not place materials such as Visqueen or Burlap, etc. on concrete, which might leave a pattern and/or imprint.

1.10 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional **twenty (20)** year "Weather Seal" warranty/warrant agreeing to replace sealant material work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.11 RELATED WORK/SECTIONS

A. Related work includes, but is not limited to, the following:

1. Water tight wall penetrations
2. Air tight wall penetrations
3. Wall construction
4. Floor construction
5. Ceiling construction
6. Roof construction
7. Windows, doors, etc.
8. Site work / flatwork and paving
9. Flashing
10. Door thresholds

B. Related sections include, but are not limited to the following:

1. Division 1

1.12 OPERATION AND MAINTENANCE DATA

A. Submit as part of project closeout:

1. Complete instructions regarding maintenance of the materials, finishes, etc.
2. Refer to Division 1 for closeout submittal procedures.

1.13 SEQUENCING AND SCHEDULING

A. Schedule work and sequence with **General Contractor**.

B. Schedule required testing, prior to the installation of materials, components, etc.

1.14 EXTRA MATERIAL

A. Submit as part of project closeout:

1. Provide extra material for each product type, color, finish, etc. in same lot as installed product.
 - a. Furnish written certification that extra materials supplied have been inspected and Re-confirmed to be the same as those used in the work.
2. Provide extra material in unopened fully labeled containers.
 - a. Do not supply anything less the full carton containers.
 - b. Furnish in factory packaged and labeled cartons and identify cartons with Project name.
 - c. Deliver materials to project premises just prior to substantial completion, and store in the location directed by the **Owner**.
3. Provide the following:

- a. 6 tubes/ sausages of each type and color of sealant used.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturer shall be one of the following and as herein listed and in Drawings:
 1. Exterior: Dow Corning, www.dowcorning.com
 2. Interior at specific locations: Pecora Corporation, www.pecora.com
 3. Interior typical unless indicated otherwise: Dow Corning, www.dowcorning.com
 4. Interior Tile installation, Typical Laticrete, www.laticrete.com or Merkrete
 5. Two sided adhesive tapes: 3M, <http://solutions.3m.com>
 6. Mastic / Sealant to set door thresholds in: Tremco, www.trimcosealants.com
 7. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
 - d. No acceptable substitutions for exterior 100% silicone sealants, unless herein otherwise indicated.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS – SEALANT JOINT SCHEDULE

A. **Sealant- Exterior Joints:**

1. General:
 - a. Intent is that buildings be rendered weathertight in every respect.
 - b. Intent is that wall and roof assemblies be rendered watertight at sealant joints.
 - c. Render wall penetrations airtight.
 - d. Render bottom of wall conditions airtight.
 - e. Workmanship shall be of the highest quality in accordance with the best practice, an in strict compliance with the recommendations of the manufacturer of the material being used.

2. Horizontal and Vertical joints, typ. u.o.n., including but not limited to:
 - a. Concrete, Masonry, Natural Stone, Simulated Stone, Terra Cotta and Wood:
 - 1) Dow Corning: 795 Type 3
 - b. Painted Metals, Anodized Aluminum, Mill Finish Aluminum, PVC, Glass, Ceramic and/or Porcelain Tile, Glazed Terra Cotta, Glazed Ceramic and/or Porcelain tile:
 - 1) Dow Corning: 795 Type 3
 - c. Concrete Flatwork:
 - 1) Dow Corning SL (Self Leveling) Type 6 – Level Conditions
 - 2) Dow Corning NS (Non Sag) Type 6 – Sloped conditions
 3. Metal Coping: (Cross joints)
 - a. Dow Corning: 795 Type 3
 4. Vertical concealed joints in:
 - a. Metal curtain wall, lapped joints, and metal building panels:
 - 1) Dow Corning: 795 Type 3
 - b. Exterior Gypsum Sheathing:
 - 1) Dow Corning: 795 Type 3
 - c. Vehicular drives: Dow Corning FC (Fast Cure) Type 5 – Extreme movement conditions
 - d. Dow Corning SL (Self Leveling) Type 5 – Level conditions
 - e. Dow Corning NS (Non Sag) Type 6 – Sloped conditions
 5. Windows:
 - a. Wet seal glazing:
 - 1) Dow Corning: 791 Type 2
- B. **Sealant - Interior Joints – Horizontal and Vertical:**
1. Expansion and control joints, typ. u.o.n.:
 - a. Non – Sanitary conditions:
 - 1) Pecora Dynatred 40+ Type 10
 - b. Horizontal traffic surfaces
 - 1) Pecora Dynatred 40+ Type 10
 - c. Subject to heavy traffic loads or point loading such as high heel traffic:
 - 1) Pecora Dynatred 40+ Type 10
 - d. Warehouse Floors

- 1) Sonneborn EPOLITH - P Type 12 Horizontal applications
 - 2) Sonneborn EPOLITH - G Type 12 Vertical applications
2. Trim or finish joints subject to minimal movement:
 - a. Pecora AC-20 + Silicone Type 9
3. Concealed applications:
 - a. Requiring acoustical seal:
 - 1) Pecora AC-20 + Silicone Type 9
 - b. Base of wall between gypsum board and concrete floor:
 - 1) Pecora AC-20 + Silicone Type 9
 - c. Wall penetrations seal:
 - 1) Pecora AC-20 + Silicone Type 9

2.3 MATERIALS – SEALANT SPECIALTY SCHEDULE

A. Below Door Thresholds:

1. Application: Set threshold in full bed of sealant also indicated as mastic
2. Product options:
 - a. Mfgr: Tremco
 - b. Type: One part polyurethane
 - c. Model: Vulkem 116
 - d. Color: Black
 - e. Application: ½" thick maximum bed prior to compressing down with threshold

B. Below Storefront and/or Curtainwall Sill Mullions:

1. Application: Set sill in full bed of sealant also indicated as mastic
2. Product options:
 - a. Mfgr: Tremco
 - b. Type: One part polyurethane
 - c. Model: Vulkem 116
 - d. Color: Black
 - e. Application: ½" thick maximum with bed prior to compressing down with threshold

2.4 MATERIALS - SEALANTS / CAULKING TYPES

A. Schedule and Data:

1. **Sealant Type 1:**

- a. Type: Single component, ultra low modulus, silicone rubber sealant;
- b. Standards
 - 1) ASTM: C661, C679, C719, C794, C1135, C1248, D412, D624, D2240, D3960
 - 2) VOC: 43g / liter max.
- c. Movement capability: 100% extension, 50% compression.
- d. Mfgr: Dow Corning
- e. Product: **790** Silicone Building Sealant – H.P.
- f. Features: USDA approved
- g. Primer: Refer to Table I of Spec-Data sheet for sealant, to include:
 - 1) 1200 Prime Coat
 - 2) 1593 Cleaner/Primer
- h. Backer rod / Tape:
 - 1) Closed-cell polyethylene, non-gasing polyolefin, polyethylene tape
 - 2) Open-cell polyurethane required at nonporous substrates
 - 3) Open-cell polyurethane required at double joint conditions
- i. Colors:
 - 1) **Architect** to pick color(s) from mfgr's full line of colors.

2. **Sealant Type 2:**

- a. Type: Single component, medium modulus, elastomeric silicone sealant;
- b. Standards
 - 1) ASTM: C603, C639, C679, C794, C1135, C1248, D624, D2240, D3960
 - 2) VOC: 46g / liter max.
- c. Movement capability: 50% extension, 50% compression.
- d. Manufacturer: Dow Corning
- e. Product: **791** Silicone Perimeter Sealant
- f. Features: Appropriate for End-dams and Internal seals
- g. Primer: Confirm with sealant manufacturer and test surface for adhesion
- h. Backer rod / tape:
 - 1) Closed-cell polyethylene foam

- 2) Open-cell Polyurethane
- 3) Polyethylene tape
- 4) Open-cell polyurethane required at nonporous substrates
- 5) Open-cell polyurethane required at double joint conditions

i. Color:

- 1) **Architect** to pick color(s) from mfgr's full line of colors.

3. **Sealant Type 3:**

- a. Type: Single component, silicone rubber sealant;
- b. Standards
 - 1) ASTM: C510, D412, D624, D1149, D2240, D3960, E119
 - 2) UL: 263
 - 3) VOC: 28g / liter max.
- c. Movement capability: 50% extension, 50% compression.
- d. Manufacturer: Dow Corning
- e. Product: **795** Silicone Building Sealant
- f. Features: Structural, non-structural and weatherproofing
- g. Primer:
 - 1) Confirm with sealant manufacturer and test surface for adhesion
 - 2) Use recommended primer
- h. Backer rod / tape types:
 - 1) Closed-cell polyethylene foam
 - 2) Open-cell Polyurethane
 - 3) Polyethylene tape
 - 4) Mineral Wool – Fire rated assemblies
 - 5) Compression Gasket
 - 6) Open-cell polyurethane required at nonporous substrates
 - 7) Open-cell polyurethane required at double joint conditions
 - 8) Color:
 - a) **Architect** to pick color(s) from mfgr's full line of colors.

4. **Sealant Type 4:**

- a. Type: One-part, ultra-low modulus, cold applied, self-leveling silicone rubber;

- b. Condition: Level Conditions
- c. Standards
 - 1) ASTM: C719, C1135, D412, D2240, D3960
 - 2) VOC: 30g / liter max.
- d. Movement capability: 100% extension, 50% compression.
- e. Slope: Up to 6%
- f. Manufacturer: Dow Corning
- g. Product: **SL**
- h. Features: Fast cure, parking structure sealant – cures with air moisture
- i. Primer: Confirm with sealant manufacturer
- j. Backer Rod: Closed-cell polyethylene foam
- k. Color: Grey

5. **Sealant Type 5:**

- a. Type: One-part, low modulus, cold applied, silicone rubber;
- b. Condition: Sloped or vertical Condition
- c. Standards
 - 1) ASTM: C661, C719, C794, C1135, D412, D3960
 - 2) VOC: 37g / liter max.
- d. Movement capability: 100% extension, 50% compression.
- e. Slope: Horizontal and Vertical
- f. Manufacturer: Dow Corning
- g. Product: **NS**
- h. Features: Non-sagging, cures with air moisture
- i. Primer: Confirm with sealant manufacturer
- j. Backer Rod: Closed-cell polyethylene foam
- k. Color: Grey

6. **Sealant Type 6:**

- a. Type: Single component sealant;
- b. Standards
 - 1) ASTM: D412, D624, D2240, D3960
 - 2) VOC: 40g / liter max.

- c. Movement capability: 25% extension, 25% compression.
- d. Manufacturer: Dow Corning
- e. Product: **999-A** Silicone Building & Glazing Sealant
- f. Features: FDA & USDA approved
- g. Primer: Refer to "Surface Preparation Guide, No. 61-182"
- h. Backer rod / tape:
 - 1) Closed-cell polyethylene foam
 - 2) Polyurethane
 - 3) Polyethylene tape
- i. Color:
 - 1) **Architect** to pick color(s) from mfgr's full line of colors.

7. **Sealant Type 7:**

- a. Type: (Type II) Two component, non-sag polyurethane rubber;
- b. Paintability: Yes
- c. Standards
 - 1) ASTM: C920, C1247, D1850, D3960
 - 2) VOC:
 - a) Activator: 104g / liter
 - b) Base: 14g / liter
- d. Movement capability: 25% extension and 25% compression.
- e. Manufacturer: Pecora
- f. Product: Dynatread 40+
- g. Features: Traffic sealant
- h. Backer Rod: Closed-cell Polyethylene
- i. Primer: Refer to manufacturer's product data
- j. Color:
 - 1) **Architect** to pick color(s) from mfgr's full line of colors.

8. **Sealant Type 8:**

- a. Type: (Type I) Two component urethane
- b. Standards
 - 1) ASTM: C920, D1850, D3960

- 2) VOC: 0g / liter
- c. Movement capability: 25% extension and 25% compression
- d. Manufacturer: Pecora
- e. Product: NR-200 Urexpan
 - 1) Activator
 - 2) Base
- f. Features: Traffic grade sealant
- g. Backer Rod: Closed-cell Polyethylene
- h. Primer: Refer to manufacturer's product data
- i. Color:
 - 1) **Architect** to pick color(s) from mfgr's full line of colors.

9. **Sealant No. 9:**

- a. Type: One part Butyl Rubber compound
- b. Standards
 - 1) ASTM: C1085, D3960
 - 2) VOC: < 250g / liter
- c. Movement capability: 5% extension and 5% compression
- d. Manufacturer: Pecora
- e. Product: **BC-158**
- f. Features: USDA Approved
- g. Backer rod / tape:
 - 1) Pecora #92 Green rod
 - 2) #91 Denver Foam
 - 3) Bond break or tape
- h. Primer: Not required
- i. Color:
 - 1) **Architect** to pick color(s) from mfgr's full line of colors.

2.5 MATERIALS – TAPES

A. Schedule and Data:

1. **Tape:**

- a. General:

- 1) Mfgr: 3M
 - 2) Series: VHB and as noted
 - 3) Reference: 3M Design Guide for Metal Fabrication
 - 4) Coordinate with Section 10 14 00 - Signage
- b. Schedule:
- 1) **Painted metal to painted metal:**
 - a) Material: Closed cell acrylic foam
 - i. Product: 4979F
 - a. Width: 1"
 - b. Thickness: 1.6 mm ($\pm$ 1/16")
 - c. Adhesive: Acrylic
 - d. Liner Type: B (5 mil clear polyethylene film)
 - e. Color: Black
 - 2) **Painted metal to bare painted metal:**
 - a) Material: Closed cell acrylic foam
 - i. Product: 5962
 - a. Width: 1"
 - b. Thickness: 1.6 mm ($\pm$ 1/16")
 - c. Adhesive: Synthetic
 - d. Liner Type: D (5 mil red polyethylene film)
 - e. Color: Dark Grey
 - 3) **Powder coated metal to powder coated painted metal:**
 - a) Material: Closed cell acrylic foam
 - i. Product: 4645
 - a. Width: 1"
 - b. Thickness: 1.6 mm ($\pm$ 1/16")
 - c. Adhesive: Acrylic
 - d. Liner Type: D (5 mil red polyethylene film)
 - e. Color: Dark Grey
 - 4) **Bare metal to bare metal:**
 - a) Material: Closed cell acrylic foam

- i. Product: 4955
 - a. Width: 1"
 - b. Thickness: 2.0 mm ($\pm 5/64$ ")
 - c. Adhesive: Synthetic
 - d. Color: White

5) **Plastics and powder coated metals:**

- a) Material: Closed cell acrylic foam
 - i. Product: 5962
 - a. Width: 1"
 - b. Thickness: 62 mil
 - c. Adhesive: Adhesive 300 Acrylic & polyester carrier
 - d. Liner Type: Densified Kraft
 - e. Colors:
 - i). White
 - ii). Black
 - iii). Red

2.6 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

1. Primers, Solvents and Backing Material

- a. General:
 - 1) Use acceptable type as recommended by each specific sealant used and the respective manufacturer.
 - 2) Material shall be manufactured by manufacturer of sealant being used, unless approved otherwise by sealant manufacturer.
 - 3) Materials shall be delivered to the job in sealed containers with manufacturer's original labels attached and associated installation instructions.
 - 4) Materials shall be used according to manufacturer's printed instructions.

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify. Prior to all work of this Section, carefully inspect and verify that the installed work of all other trades is complete to the point where this work may properly commence.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

A. General:

1. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

B. Joint Preparation:

1. Preparation, cleaning, priming and installation shall be performed in strict accordance with sealant manufacturer's recommendations.
2. Refer to REFERENCE STANDARDS heading for sealant manufacturers guidelines.

C. Surface Preparation

1. Sealants

a. General:

- 1) Typically seal joints before painting, coordinate with wall finish type, material and manufacturer's written recommendations for all exceptions.
- 2) Joints and surfaces, which are to be caulked or sealed, shall be clean, dry, frost free, free of dust, loose mortar, and other foreign materials.
- 3) Temperature Installation Requirements: 40°F minimum application temperature for joint sealant installations because of the possibility of moisture and/or frost contamination on sealing surfaces: (Comply with sealant manufacturer's written recommendations)
 - a) However, it is recognized that applications may have to be made at lower temperatures. When this is necessary, steps must be taken to assure dry, frost-free surfaces and is the responsibility of the caulking subcontractor. Additionally these procedures must be in compliance with sealant manufacturer's written recommendations.

- 4) Clean ferrous metals of all rust, mill scale and temporary coatings by wire brushing, grinding, or sandblasting.
 - 5) Remove oil and grease with high performance cleaners as approved by sealant manufacturer.
 - 6) On joints adjacent to porous substrates install appropriate primer prior to application of sealant.
 - 7) Joint dimensions for sealant should be reviewed and installed in accordance with sealant manufacturer's printed instructions. In no case should the sealant application be less than 1/4" wide and 1/2" deep, except in specific metal-to-metal curtainwall applications and then as recommended by the sealant manufacturer.
 - 8) Precast concrete, cast-in-place concrete, or masonry joint surfaces shall be wire brushed, then brushed clean or blown clean with dry, oil free compressed air.
 - a) The joint interface must be free of form release agents, curing and sealing compounds or chemical retarders which may interfere with sealant cure, adhesion and performance.
 - 9) Sealants shall not be applied to masonry joints where a water repellent or masonry preservative has been applied prior to caulking.
 - a) Waterproofing treatments shall be applied after caulking.
 - 10) Do not caulk joints until they are in compliance with requirements of the approved manufacturers of the materials, the details as shown on the drawings, and the specific requirements of other sections of this Specification.
- b. Silicone Sealants:
- 1) Basic steps for proper joint preparation:
 - a) Clean – Joint surfaces must be clean, dry, dust free, and frost free.
 - b) Prime – If required, primer is applied to the surface(s). (Refer to Sealant Manufacturer's written recommendations.
 - c) Pack – Backer rod or bond breaker as required for sealant joint and in accordance with manufacturer's written instructions.
 - d) Shoot – Sealant is applied by "pushing the bead" into the joint cavity.
 - e) Tool – Dry tooling techniques are used to strike a flush joint and make certain the sealant has the proper configuration and fully contacts the joint walls.
 - 2) Clean – Substrate Cleaning Procedures
 - a) General procedures for porous and non-porous substrates key to good sealant adhesion is a clean surface. Always check with the supplier of the substrate to ensure that the cleaning procedures and solvents are compatible with the substrate.
 - i. Organic Solvent Usage

- a. Not every contamination is effectively removed by every solvent, and some substrates can be seriously damaged by certain solvents. Please follow the solvent manufacturer's safe handling recommendations and local, state and federal regulations regarding solvent usage.
- ii. Non-Porous Substrates
 - a. Non-porous surfaces must be cleaned with a solvent before the sealant is applied.
 - b. Use the "two-cloth" cleaning method explained later in this section.
- iii. Porous Substrates
 - a. Building materials such as EIFS, cement board panels, concrete, granite, limestone and other stones or cementitious materials that absorb liquid are considered porous substrates.
 - b. Dusting alone may be sufficient cleaning for new porous substrates. Depending on the condition of the surface, porous substrates may require abrasion cleaning, solvent cleaning or both. Laitance and surface dirt must be completely removed. Concrete form-release agents, water repellents and other types of surface treatments, protective coatings, and old sealant all affect sealant adhesion. Removal of these treatments, coatings or sealants by abrasion cleaning may be required to obtain acceptable adhesion.
 - c. Abrasion cleaning involves grinding, saw cutting, sand or water blasting, mechanical abrading or a combination of these methods. Remaining dust and loose particles should be removed by dusting the surface with a stiff brush, vacuuming, or blowing the joints with oil-free compressed air. Once the abraded surface is clean and dry, the sealant can be applied. If the surface is dirty, it must be solvent cleaned with the "two-cloth" method explained later in this section. Some porous materials will trap solvents after cleaning or priming. Allow this solvent to evaporate before sealant is applied.
 - d. Please note sealant recommendations for removal of existing sealants, substrate cleaning, joint preparation and installation of sealants are not intended and may not be appropriate for remedial work involving existing sealants and/or joints containing PCB's, asbestos, or other potentially hazardous substances. If you know or suspect that the existing sealants and/or joints contain PCB's or other hazardous substances, contact project Owner **General Contractor** and a knowledgeable authority on appropriate removal, handling and disposal procedures.
- iv. Masking
 - a. Silicone primers and sealants cannot be removed with organic solvents. It is imperative that uncured silicone primers and sealants do not contact

non-abradable surfaces where the silicone is not intended. Mask these surfaces or use extreme care to prevent any silicone contact with the surface during priming and sealant application.

- v. "Two Cloth" Cleaning/Priming Method
 - a. (Using DOW CORNING P5200 Cleaner/Primer)
 - i). Clean, soft, absorbent, lint-free cloths must be used. The two-cloth cleaning method consists of a solvent wipe followed by a dry cloth wipe.
 - ii). Thoroughly clean all surfaces of loose debris. Mask or tape joints before applying Cleaner/Primer. If a bond breaker tape will be used instead of backer rod, the tape should be applied before the cleaner/primer.
 - iii). Clean and apply Cleaner/Primer product in accordance with manufacturer's written recommendations.

2. Tapes

- a. Prepare per manufacturer's recommendations.
- b. Prime as required by manufacturer for each specific tape.

3.4 INSTALLATION

A. Sealant

1. General:

- a. Clean, prime and apply materials in accordance with printed recommendations of manufacturer of material used.
- b. Insure that if two sealant-curing types are used which have different curing times, that the first installed sealant is fully cured prior to the application of the second sealant.
 - 1) Confirm application with sealant manufacturer.
- c. Insure that if two different sealant composition types are used, that the proper sealant is installed first to insure adhesion between the two different sealants.
 - 1) Confirm application with both sealant manufacturers.
- d. Install joint backing with a blunt instrument so as not to puncture the surface skin.
 - 1) Size of closed cell joint backing should be determined by adding 25% to the joint width to assure proper compression of the rod.
 - 2) With other types of joint backing, consult manufacturer's printed instructions for proper use.
- e. Apply sealant with a caulking gun, using proper nozzles. Use sufficient pressure to properly fill the joints with sealant to the backup material.

- 1) After joints have been completely filled, they shall be neatly tooled to eliminate air pockets or voids and to provide a smooth, neat finish in intimate contact with interfaces. Dry tooling is preferred.
 - 2) After tooling, surface of sealant shall be free from ridges, wrinkles, sags, air pockets and embedded impurities.
 - f. Immediately clean adjacent materials, which have been soiled. Leave work in a neat, clean condition.
 - g. Joint Dimensions
 - 1) Size and shape as shown on Drawings but not to exceed joint size recommended by sealant manufacturer.
 - a) Typically install backer rod at all joints unless specified to be bond breaker tape, other material as specified and /or detailed or no backer material in accordance with sealant manufacturer's printed directions.
 - i. Sealant depth to width ratio shall be installed in accordance with sealant manufacturer's written instructions.
2. Silicone:
- a. General:
 - 1) Apply materials in accordance with printed recommendations of manufacturer of material used.
 - b. Schedule:
 - 1) Prime – Primer Application Procedure
 - a) DOW CORNING P5200 Cleaner/Primer Coat should be applied as follows:
 - i. Joint surfaces should be clean and dry.
 - ii. Apply masking tape to the surfaces next to the joint to keep excess primer and sealant off areas where they are not intended.
 - iii. Apply Cleaner/Primer in accordance with manufacturer's written recommendations.
 - 2) Pack – Packing with Backer rod / tape
 - a) Moving Joint Considerations
 - i. When designing moving joints, the following points also need consideration:
 - a. A minimum 1/4" joint width is recommended. Wider joints accommodate more movement than narrow joints. (Refer to Drawings for design intent joint widths)
 - b. Three-sided adhesion limits the amount of movement that a joint accept without inducing a tear. Three-sided adhesion can be eliminated by the

addition of a bond breaker tape or backer rod. With three-sided adhesion, no more than +15% movement can be accommodated.

- c. A thin sealant joint (1/4" + 1/8" depth) will absorb more movement than a thick joint. Sealants are designed to deliver optimum performance when the joints are shaped like an hourglass
- d. As a practical matter, as the sealant joint width becomes larger than 1", the depth should be held at approximately 3/8". There is no need to increase the depth beyond 3/8".

b) Movement During Cure

- i. One-part sealants cure by taking moisture out of ambient air. Joint movement during cure can cause unsightly aesthetics due to joint wrinkling. Premature adhesion loss can also occur because the adhesive characteristics of the sealant are obtained after the sealant has cured. Adhesion loss due to movement during cure can be minimized by the use of a primer. Primers can decrease the adhesion cure time lag. Minimize wrinkling by following these suggestions:
 - a. Use open-cell polyurethane backer rod / tape in non-EIFS or vertical applications.
 - b. Seal when the joint surface is cool and will experience minimum temperature changes, typically in the late afternoon or early evening.
 - c. Place no more than 1/4" of sealant over the backer rod / tape at the center.

3) Shoot – Sealant Application Procedure

- a) It is critical that the sealant fills the entire joint or cavity and firmly contact all surfaces intended to receive sealant.
- b) To obtain full adhesion, sealants require a clean, dry, frost-free surface.
- c) Sealant shall be applied as follows:
 - i. As previously indicated, masking tape should be used to keep excess sealant from contacting adjacent areas where it is not intended to ensure an aesthetically-pleasing job.
 - ii. Apply the sealant in a continuous operation using a caulking gun or pump. A positive pressure, adequate to fill the entire joint width, should be used. This can be accomplished by "pushing" the sealant ahead of the application nozzle. Care must be taken to ensure complete fill of the sealant cavity.

4) Tool

- a) Tool the sealant with light pressure before a skin begins to form (typically 10 to 20 minutes). Tooling forces the sealant against the back-up material and the joint surfaces. Do not use liquid tooling aids such as water, soap or alcohols; i.e. These materials may interface with sealant cure and adhesion and create aesthetic issues.

- b) Remove the masking tape before the sealant skins over (within about 15 minutes of tooling).

B. Polyurethane and Butyl Rubber:

1. Storefront and/or Curtainwall Sills & Door Thresholds

- a. Clean substrate and underside of threshold
- b. Installation:
 - 1) 1st. Prime substrate with mfg's approved primer
 - 2) 2nd. Install full bed of sealant to substrate x 1/2" maximum thickness
 - 3) 3rd. Install full bed of sealant to underside of threshold x 3/8" and set together.
 - 4) 4th. Trim sealant that pushes out from under threshold.
 - 5) 5th. Install mechanical fasteners.

C. Tape

1. Clean surfaces as herein listed.
2. Prime substrates per manufacturer's recommendations.
3. Install per manufacturer's written instructions.

3.5 COMMISSIONING

- A. Provide factory-certified field service engineer to a site visit to ensure proper system installation of exterior sealant.

3.6 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator.
1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.
- C. The sealant applicator shall certify in writing that the sealant application is in accordance with the sealant manufacturer's recommendations

3.7 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.

- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 07 92 00

SECTION 08 11 13 – STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. STEEL DOORS: (fully welded assembly)
 - a. Interior:
 - 1) Non-rated
 - 2) Door vision panel frames
 - a) Non-rated.
 - b. Exterior:
 - 1) Non-rated
 - 2) Door vision panel frames
 - a) Non-rated.
 - 3) Door louvers.
 - a) Non-rated.
 - 2. STEEL DOOR FRAMES: (fully welded assembly)
 - a. Interior:
 - 1) Non-rated
 - 2) Sound attenuation fill
 - b. Exterior:
 - 1) Non-rated
 - 2) Fully grouted with mortar type grout
 - 3) Continuous watertight nail flange
 - 3. STEEL WINDOW FRAMES: (fully welded assembly)
 - a. Exterior:

- 1) Non-rated
- 2) Fully grouted with mortar type grout
- 3) Continuous watertight nail flange
4. GLASS:
 - a. Door lites: As herein specified
 - b. Framed windows: Refer to Section 08 80 00 – Glass and Glazing
5. Accessories:
 - a. Sound deadening spray foam
 - b. Fire rated mineral wool filler.
 - c. Bituminous water base paint
 - d. Grout

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American National Standards Institute (ANSI), www.ansi.org
 1. ANSI/SDI A250.3 Test Procedure & Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors & Frames
 2. ANSI/SDI A250.4 Test Procedure & Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors & Hardware Reinforcing
 3. ANSI/SDI A250.6 Recommended Practice for Hardware Reinforcing on Standard Steel Doors & Frames
 4. ANSI/SDI A250.7 Nomenclature for Standard Steel Doors & Steel Frames
 5. ASNI/SDI A250.8 SDI 100 Recommended Specifications for Standard Steel Doors & Frames
 6. ANSI/SDI A250.11 Recommended Erection Instruction for Steel Frames
- E. American Society For Testing and Materials (ASTM), www.astm.org
- F. Factory Mutual (FM), www.fmglobal.com
- G. Hollow Metal Manufacturers Association (HMMA), www.naamm.org/hmma
 1. Hollow Metal Technical and Design Manual, latest edition of the following:

- a. Manufacturing: HMMA 802 Manufacturing of Hollow Metal Doors and Frames
- b. Doors: HMMA 810 Hollow Metal Doors
- c. Frames: HMMA 820 Hollow Metal Frames
- d. Hardware: HMMA 830 Hardware Preparation and Locations for Hollow Metal Doors and Frames
- e. Installation: HMMA 841 Reserved for Tolerances and Standard Practices for Hollow Metal Doors and Frames

- f. Continuous Fully Welded Frames: HMMA 820-TN02-03
- g. Defining Door Undercuts: HMMA-810 TN01-03
- h. Grouting Hollow Metal Frames: HMMA-820 TN01-03
- i. Guidelines for Glazing, windows & sidelights: HMMA-820 TN03-07
- j. Painting Hollow metal frames: HMMA-840 TN01-07
- k. Maintenance of Installed Hollow metal frames: HMMA-840 TN02-10
- l. Grouting door frames: HMMA-862
- H. National Association of Architectural Metal Manufacturers (NAAMM) www.naam.org
- I. National Fire Protection Association (NFPA), www.nfpa.org
 - 1. NFPA 80 Labeled Protective assemblies
 - 2. NFPA 105 Installation of Smoke and Draft Control of 20 minute labeled door assemblies
 - 3. NFPA 252 Smoke and Draft Control of 20 minute labeled door assemblies
 - 4. NFPA 257 Glazing in Fire Rated Door Assemblies
 - 5. NFPA 288 Floor Fire Door Assemblies
- J. Steel Door Institute (SDI), www.steeldoor.org
 - 1. Steel Door Institute Technical Data Series Guidelines
 - 2. Steel Door Institute 110-09
- K. Underwriters Laboratory (UL), www.ul.com
 - 1. UL 10A
 - 2. UL 14B
 - 3. UL 14C
 - 4. UL 1784 – Smoke and Draft control
 - 5. Provide door assembly with "S" label

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Labeled Doors and Glazing:	Floor Fire Door Assemblies	Comply	CBC, Sections 715.3, 715.4 715.4.1, 715.4.2, 715.4.3, 715.4.5, 715.4.6, 715.4.6.2, 711.8 ASTM E152-81a
	Fire Door and Shutter Assemblies		CBC, Section 715.4
	Fire Door and Shutter Fire Protection Ratings		CBC, Section 715.4
	Door Assemblies in Corridors and Smoke Barriers		CBC, Section 715.4.3
	Smoke and Draft Control and Labeling		CBC, Section 715.4.3.1 & 715.4.6.3
	Doors in Exit Enclosures and Exit Passage ways		CBC, section 715.4.4
	Glazing in Doors		CBC, Sections 715.4.3.2 & 715.4.4.1
	Labeled Protective Assemblies		CBC, Sections 715.4.6, 715.4.6.1 & 715.4.5 & 715.4.5.1
	Fire Door Labeling Requirements & Identification		CBC Section 715.4.6.1, 715.4.5.3, 715.4.7.3, 715.4.7.3.1
	Door Closing	Self or automatic closing	CBC Sections 715.4.8 & 715.4.8.2
	Latching	Latch required	CBC, Section 715.4.8.1
	Smoke Activated Closing	Comply	CBC, Section 715.4.8.3

Door Frames	Anchorage	Jambs: Anchors shall be located on each jamb starting from 4" from top and 24" on center maximum on down with floor anchor at base	NAAMM Standards HMMA 840, 861 & 830
		Head: Provide anchors at head not more than 24 inches on center and not less than two per door head.	
	Anchors	Jamb and Head: Anchors shall be 14 gauge galvanized steel of size and length or shape required by construction.	HMMA 830 & 863
		Floor: 12 gauge galvanized angles welded to bottom of each door jamb and vertical mullions with two holes in bottom leg for 1/4 inch wedge anchor each.	
		Concrete Block Wall: UL approved wedge anchor at dimpled holes centered on stop face of frame jambs and/or head.	
	Hardware Reinforcing	Comply	HMMA 830 Hardware Preparation Standard HMMA 861 Guide Specification
	Grout Slump	4" max. slump Pump into frame jambs and head	HMMA 820 TH01-03 HMMA 862
	Grout type	Mortar, not plaster	HMMA 862
Fire Door Frames with Transom Lights & Sidelights	Assembly	3/4 hour	CBC, Section 715.4.5
Frames	Labeling Requirements	Show mfg'r's name & third party inspection agency	CBC, Section 715.4.7
Door Frames	Assembly	Non Rated	HMMA 820 & 861
		Rated, UL or FM Labeled	HMMA 850 & 861
	Types	Security	HMMA 862
		Detention	HMMA 863
		Acoustical (STC 44 min, u.n.o.)	HMMA 865
	Gauge/thickness	Typical: 0.053" / 16 gauge	NAAMM Standards
		4'-0" or greater opening: 0.067" / 14GA	
Door Glazing	Type	Safety & fire protected	CBC, Section 715.4.7.4

Door Frame Plinths (Splats)	Assembly	Shall be same thickness as frame and flush with all jamb surfaces. (not a wrap-around surface applied component)	NAAMM Standards HMMA 820
Window Frames	Assembly/ Installation	Comply	NAAMM Standards HMMA 820, 861 & HMMA-820 TH03-07
	Material Gauge	18 gauge	NAAMM Standards
	Air Infiltration	Comply	ASTM E283
	Static Water Penetration		ASTM E331
	Dynamic Water Penetration		AAMA 501.1
Doors	Core	22 gauge steel stiffeners with insulation core	NAMM Standards
	Assembly	Non Rated:	HMMA 810
		Rated, UL or FM Labeled	HMMA 850
	Types	Security	HMMA 862
		Detention	HMMA 863
		Acoustical (STC 44 min, u.n.o.	HMMA 865
	Face	Interior: 0.042" / 18 gauge	HMMA 861
		Exterior: 0.053" / 16 gauge	HMMA 861
	Edges		HMMA 861
	U-Value	0.18 max	SDI-113-79
HMMA 861 Guide Specification	HMMA 861 Guide Specification	HMMA 861 Guide Specification	HMMA 861 Guide Specification
Door Openings	Typical	Install 16 gauge channel within door body at all sides of opening	
	Vision panel frames	0.032" / 20gauge	
	Louver frames	0.0432" / 18 gauge	SDI-100-91
Steel Frames & Doors	Painting	Comply	HMMA-840 TN01-07 & Section 09 90 00
Steel Sheets	Hot Dipped Galvanized	Comply	ASTM A653-96 coating designation A60 mill phosphatized
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Submit Manufacturer's data and shop drawings.
 - 1. Indicate construction, configuration, jointing methods, reinforcements, and locations of cut-outs of steel doors and frames.
 - 2. Submit catalog cuts or other data indicating details of construction, gauges of metals, dimensions, hardware preparation, core, label compliance, profiles and specifications for shop priming.
 - 3. Label Construction Certification:
 - a. For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification for that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.
 - 4. Identify each door and frame with Metal labels indicating similar applicable fire-rating.
 - 5. Schedule:
 - a. Submit a schedule of doors and frames using the same reference numbers for details and openings as indicated on the Contract Drawings.
 - b. Indicate coordination of glazing frames and stops with glass and glazing requirements.
 - 6. Secure templates from finish hardware supplier for specified hardware and mounting locations.
- E. Submit samples.
 - 1. One 6" x 6" of each glass type
 - 2. Glazing tape
- F. Certification:
 - 1. Fire rating of glass, doors, frames and glass lite frames

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for five (5) years providing / installing / finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for five (5) years providing/installing/finishing projects of similar size and complexity.
- D. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid
- E. Stipulations:

1. Manufacture all labeled frames in strict accordance with the specifications and procedures of Underwriters Laboratories, Inc. (UL).
- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 1. Agenda for meeting shall include, but not be limited to;
 2. Preparation for hardware
 3. Electrified hardware, power supply, conduit and wiring
- G. Miscellaneous criteria:
 1. Templates shall be furnished by hardware supplier for preparing shop drawings and for preparing and reinforcing hollow metal work to receive hardware.
 2. Where fire-resistance classification is shown or scheduled, provide fire-rated assemblies.
 - a. Identify each door, frame and vision lite with UL labels, indicating applicable fire-rating.
 - b. Provide approved fill material within door frame at acoustically labeled door/frame assemblies.
 3. Fire Rated Door Assemblies: Meet the requirements of CCR Title 24 Part 2, CBC Chapter 7 – Fire Resistant Materials and Construction for the fire resistive ratings indicated, and which are labeled by Warnock Hershey International. Fire doors and frames to comply with UBC 7-2-1997 (UL 10C) positive pressure part 1 and/or part 2 where applicable.
 - a. Temperature Rise Rating: At stairwell enclosures, provide doors which are labeled for a maximum transmitted temperature end point not to exceed 250° above the ambient at the end of 30 minutes of fire exposure.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Store doors and frames at building site under cover. Place units upright on at least 4 inch high wood sills in a manner that will prevent rust and damage.
 1. Avoid the use of non-vented plastic or canvas shelters which could create a humidity chamber.
 2. If cardboard wrapper on door or frames becomes wet, remove the carton immediately.
 3. Provide a space between stacked doors to promote air circulation.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.

- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to, the following:
 - 1. Wall Construction and finish
 - 2. Hardware supplied by others
 - 3. Hardware preparation and installation
 - 4. Electrified hardware
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 02 41 13 – Selective Site Demolition & Protection
 - 3. Section 02 41 19 – Selective Building Demolition & Protection
 - 4. Section 08 71 00 – Door Hardware
 - 5. Section 08 80 00 – Glazing
- C. Related Documents include, but are not limited to the following:
 - 1. Division 1 Supplementary Conditions

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. Preparation and painting of frames and doors

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 - 1. Doors, Door frames and Window frames
 - a. Metal Manufacturing Company, Sacramento, CA, metalmfgco1@lycos.com 916-922-3484
 - b. Stiles Custom Metal, Inc., www.hollowmetal.com 209-538-3667
 - c. Forderer Cornice Works, San Francisco, CA, (415) 431-4100
 - d. Titan Metal Products, Inc., Sacramento, CA., www.titanmetalproducts.com 916-920-2555
 - e. Door Components Inc., Fontana, CA, www.doorcomponents.com, 866-989-3667, 909-770-5700
 - f. Security Metal Products Corp, www.seet.com 310-641-6601
 - 2. Window glazing
 - a. Refer to Section 08 80 00 – Glass and Glazing
 - 3. Door Lite assembly frame & Glazing compound
 - a. Anemostat, www.anemostat.com 213-775-7441
 - 4. Door Lite Assembly Frame Glazing
 - a. TGP, Technical Glass Products, www.tgpamerica.com www.fireglass.com
 - 5. Sound Attenuation Fill – Door Frames
 - a. Owens Corning, www.owenscorning.com
 - 6. Reviewed Equivalent by **Architect.**
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. General
 - 1. Hot Dip Galvanized Steel Sheets
 - 2. Honeycomb Core Material
 - 3. Polystyrene Core Material

4. Mineral Fiberboard Core Material

5. Shop Applied Primer: Rust-inhibitative enamel or paint, either air drying or baking, suitable as a base for specified finish paints.

B. Doors

1. General:

- a. Comply with NAAMM Standards, most current published edition as herein specified.
 - 1) Unless otherwise indicated, provide fire ratings as indicated on the drawings, and as required by building code.
 - 2) Glazing shall be as approved for rated assemblies and in accordance with glazing specifications.
 - 3) Glazing shall be as approved for safety assemblies and in accordance with glazing specifications.

C. **Door Frames**

- 1. Comply with NAAMM Standards, most current published edition as herein specified.
 - a. Shop assembled where possible, size as scheduled or indicated, gauges as herein specified.
 - b. Except at fire assemblies, furnish and install three rubber silencers for strike jambs of single frames and two for heads of double frames, u.n.o. in hardware groups.
 - c. All glazing stops shall have miter corners as standard requirement.
 - d. Fabricate as "fully & continuously" welded assembly.
 - e. Fabricate with continuous watertight 2" wide nailing flange at jamb and head – exterior side of frame.
- 2. Comply with NAAMM Standards, most current published edition;
 - a. Hollow metal frames: Refer to standards as herein specified
 - b. Hardware prep for Hollow metal frames: Refer to standards as herein specified
 - c. Guide Specifications – Commercial: Refer to standards as herein specified
- 3. Anchors:
 - a. Comply with HMMA 861, including, but not limited to Article 2.05 A, B, C.
 - b. Three at jambs, min. and one floor anchor per jamb, typical unless required differently per frame type application.
 - c. Plinth:
 - 1) Stainless steel, same thickness as rest of frame and flush with rest of jamb.
 - d. Schedule (Doors):
 - 1) As indicated in the drawings and the door and window schedule within.

D. **Window Frames:**

1. Assembly:
 - a. Comply with
 - 1) NAAMM Standard, HMMA 820, 861, Article 2.05 Hollow Metal Frames
 - 2) Guidelines for Glazing of Hollow Metal Transoms, Sidelights & Windows: HMMA-820 TH03-07
 - 3) Continuously welded per HMMA-820 TN02-03
 - a) Fabricate as "fully & continuously" welded assembly where frame can be set and wall built around it, typical condition.
2. Shop assembled where possible, size as scheduled or indicated, gauges as follows:
 - a. Window frames: 14 gauge
3. Anchor; comply with HMMA 861, Article 2.05 A, B,
 - a. Three at jambs, min. and one sill anchor per jamb, typical unless required differently per frame type application.
4. Glazing Stops:
 - a. Shall have miter corners as standard requirement and be secured with flush head screws in dimpled stop holes.
5. Maintain Fire rating integrity at all fire rated walls.
6. Components:
 - a. Stops
 - 1) Frames shall be setup to accommodate glass thickness, coordinate with Section 08 80 00 and **General Contractor**.
 - 2) Stops shall be furnished in size as required by the glass type used, refer to Section 08 80 00.
 - b. Spacer blocks
 - c. Heel Bead
 - d. Sealant
 - e. Cap bead of Sealant: Wet seal at exterior of exterior frames
- E. **Hardware reinforcement**
 1. Comply with NAAMM Standards, most current published edition;
 - a. HMMA 830 Hardware Preparation Standard
 - b. HMMA 861 Guide Specification
- F. **Glass lites in doors**
 1. **Glazing:**
 - a. Mfg: TGP, Technical Glass Products, www.tgpamerica.com www.fireglass.com

- b. Size: Maximum size, refer to frame maximum lite size criteria
- c. Color: Clear
- d. Tempered: Yes
- e. Testing: ANSI Z97.1 – 2004
- f. Schedule:

Rating:	Product:	Thk:	Description:
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- | | | | |
|----------|-------------|------|---------------------|
| 1) None. | Fireglass20 | 1/4" | Impact/safety rated |
|----------|-------------|------|---------------------|

2. **Frame:**

- a. Mfgr: Anemostat
- b. Material: 20ga. Cold rolled steel
- c. Color: Factory grey primer for field painting – as selected by **Architect**
- d. Attachment: Self attaching
- e. Profile: Low profile
- f. Door thickness:

- 1) Typical: 1-3/4"

- 2) LoPro-IS-G: Refer to door schedule for door thickness

- g. Ratings Schedule: Rating as required, refer to drawings and door schedule.

- 1) Rating: Maximum visible lite size

- a) 20 min. 3204 sq.in

- b) 45/60 min. 2772 sq.in

- c) 90 min. 1296 sq.in.

- d) 180 min. 100 sq.in.

- h. Schedule:

Profile:	Product:	Size:	Glass thk:
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- | | | | |
|-----------|-------|--------------|---------------|
| 1) Circle | Lo-FP | 12", 18: 24" | 1/4" or 5/16" |
|-----------|-------|--------------|---------------|

- | | | | |
|----------------|-------|-------------------|---------------------|
| 2) Rectangular | LoPro | Refer to drawings | 1/4", 3/16" & 5/16" |
|----------------|-------|-------------------|---------------------|

- | | | | |
|-----------|----------|-------------------|---------------------|
| 3) Custom | LoPro-CS | Refer to drawings | 1/4", 3/16" & 5/16" |
|-----------|----------|-------------------|---------------------|

- | | | | |
|----------------------|---------|-------------------|---------------------|
| 4) Divided lite look | LoPro-G | Refer to drawings | 1/4", 3/16" & 5/16" |
|----------------------|---------|-------------------|---------------------|

3. **Tape:**

- a. Glazing tape:

- 1) Mfgr: Anemostat

- 2) Product: Fire Rated Glazing Tape

- 3) Series: GT
- 4) Rating: 20/45/60/90/180 minute
- 5) Listing: UL, WHI, BS-476.22 & EN-1634
- 6) Material:
 - a) Use thickness as required for frame opening and glass thickness
 - b) Schedule:
 - i. GT-132: 1/32" thick x 3/8" wide
 - ii. GT-116: 1/16" thick x 3/8" wide
 - iii. GT-18: 1/8" thick x 3/8" wide

G. Sound Attenuation Frame Fill: (Interior Door Frames)

- 1. Rated Conditions:
 - a. Material: Mineral Wool
 - b. Mfgr: Owing Corning or approved equivalent
- 2. Non Rated Conditions:
 - a. Material: Foam
 - b. Product:
 - 1) Spray in foam:
 - a) Manufacturer: Fomospray or Goecel
 - b) Product: Spray Insulation or Expanding foam,
 - 2) Sealant:
 - a) Manufacturer: Macklanburg-Duncan
 - b) Product: Insulating Foam Sealant.

H. Grout Frame Fill: (Exterior door Frames)

- 1. Schedule:
 - a. Material: Mortar
 - b. Type: Non shrink which cures via chemical reaction
 - c. Agents: Anti freeze in cold weather
 - d. Barrier coating: Inside of frame shall be treated with barrier coating

2.3 MATERIALS – LOUVERS – Not Used

- A. General:
 - 1. Integral assembly with Finishes:
- B. Product:

1. **Louver:**

- a. Mfgr: Anemostat
- b. Size:
 - 1) Width: 3" clear from door edges
 - 2) Height: 12", uno.
- c. Color:
 - 1) Factory finish:
 - a) Primer grey for field painted color as directed by **Architect.**
 - b) Galvanized steel
- d. Material:
 - 1) 18ga. Cold rolled steel at painted conditions
 - 2) #304 stainless steel at #4 finish louvers
- e. Mesh screen: Yes – exterior conditions
- f. Schedule - application:

1) **Interior:**

- a) Doors: (framed type louver)

	<u>Rating:</u>	<u>Product:</u>	<u>Door Thk:</u>	<u>Description:</u>	<u>Free air:</u>
i.	None.	DRDL	1-3/4"	Dbl. inverted V	60%
ii.	None.	ADL	1-3/4"	Adjustable	0-40%
iii.	20/45/60/90min.	FLDL-UL	1-3/4" – 2-1/2"	Fusible Link	40%

- b) Doors: (inset in door/ frameless type)

	<u>Rating:</u>	<u>Product:</u>	<u>Door Thk:</u>	<u>Description:</u>	<u>Free air:</u>
i.	None	CHDL	N/A	Inset in frame type	60%

Window frames:

	<u>Rating:</u>	<u>Product:</u>	<u>Width:</u>	<u>Description:</u>	<u>Free air:</u>
ii.	None	CHDL	1"	Inset in door	60%

2) **Exterior:**

- a) Doors: (framed type louver)

	<u>Rating:</u>	<u>Product:</u>	<u>Door Thk:</u>	<u>Description:</u>	<u>Free air:</u>
i.	None.	FPL	1-3/4"	"Z" blade	53.3%
ii.	None.	ADL	1-3/4"	Adjustable	0-40%
iii.	20/45/60/90min.	FLDL-UL	1-3/4" – 2-1/2"	Fusible Link	40%

2. **Repair foam fill:**

- a. Rated Conditions:
 - 1) Material: Mineral Wool
 - 2) Mfgr: Owing Corning or approved equivalent
- b. Non Rated Conditions:
 - 1) Material: Foam
 - 2) Product:
 - a) Spray in foam:
 - i. Manufacturer: Fomospray or Goecel
 - ii. Product: Spray Insulation or Expanding foam

2.4 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION (COMPLY WITH HMMA 820, 830)

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.
- B. Surface:
 - 1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.
- C. Hardware supplier / contractor shall supply hardware templates for preparing shop drawings and for preparing and reinforcing hollow metal work to receive hardware to hollow metal frame and door contractor.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 FABRICATION

- A. Fabricate doors, frames, concealed stiffeners, anchors, hardware reinforcement, edge channels, louvers, moldings, stops and vision panel frames from the following commercial qualify carbon steel.(maintain minimum standards per each tested assembly)
 - 1. Hot-rolled steel sheets and strips, pickled and oiled, complying with ASTM A569.
 - 2. Cold-rolled steel sheets, complying with ASTM A366.
 - 3. Galvanized steel sheets, complying with ASTM A526, G90 zinc coating.
 - 4. Inserts, bolts and fasteners shall be standard manufacturer's units, except hot-dip galvanized items to be built into walls, complying with ASTM A153, Class C or D as applicable.
 - 5. Comply with NAAMM Standard, current published edition;
 - a. Guide Specifications – Commercial:
 - 1) Hollow metal frames, Typical: HMMA 861
 - 2) Hollow metal frames, Security: HMMA 862
 - 3) Hollow metal frames, Detention: HMMA 863
 - 4) Hollow metal doors, Acoustical: HMMA 865
 - b. Manufacturing Standard: MMMA 802
- B. Steel doors, door frames and window frames shall be "Machine-Mitered and Full-Welded" joint construction, rigid, neat in appearance and free from defects, warp or buckle.
 - 1. Full welded mitered joints, continuously, grind, dress, and make smooth, flush and invisible.
 - 2. Install Knock-Down Window frames at locations that prohibit built-in place conditions where fully welded window assembly is feasible.
- C. Accurately form metal to required size and profiles.
 - 1. Shop-fit and assemble wherever practical
 - 2. Site assembled units shall be of welded construction meeting all requirements of factory assembled units.
 - 3. Construction joints shall be reinforced and machine-mitered at corners.
 - 4. Exposed fasteners shall be provided countersunk pre-fitted holes at through bolting on doors.
 - 5. Concealed fasteners at face of frame and glazing molding stops shall be pre-drilled countersunk or dimpled holes.
 - a. Supply flat head Phillips machine or Teks screws pre-fitted for field applied glazing putty.
 - 6. Reinforce doors and frames to receive surface-applied hardware, and shall be as follows.
 - a. Drilling and tapping for surface-applied hardware may be done at project site. Door shall have internal reinforcing at all surface-applied hardware.
 - b. Provide drilled holes for door silencers when required by Section 08 71 00 - Door Hardware.
 - c. Hinges; 10 gauge x 1 1/2 inches wide x 6 inches longer than hinge; full perimeter fillet weld at bearing each end.

- d. Strike plate clips; 10 ga. x 1 1/2 inches wide x 3 inches long; full perimeter fillet weld at bearing.
 - e. For Surface-applied closers; 10 gauge x required width and length, secured in both doors and frames whether or not closers are indicated. Spot welded in place. For future and/or required closer.
 - D. Paint all steel frames:
 - 1. General:
 - a. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before applying shop primer.
 - b. Apply pretreatment to clean metal surfaces, using cold phosphate solution (SSPC-PT 2), hot phosphate solution (SSPC-PT 4) or basic zinc chromate-vinyl butyl solution (SSPC-PT3).
 - c. Install barrier coating at inside of all frames including the ones to be fully grouted with mortar.
 - 2. Primer:
 - a. Apply shop primer within time limits recommended by pretreatment manufacturer.
 - b. Apply a smooth primer coat of even consistency to provide a uniform dry film thickness of not less than 2 mils, on all hollow metal surfaces.
 - 1) Door primer surface shall be completely smooth to the touch and visual.
 - 3. Painting:
 - a. Shop paint 1st. coat when possible
 - b. Finish painting shall be in accordance with Paint Specification Section 09 90 00.
 - c. Paint frame and doors custom color as directed by **Architect**.
 - E. Sound-deaden and/or fully fill all interior steel frames:
 - 1. Interior:
 - a. Provide and install appropriate spray foam material inside non rated frame prior to erection
 - b. Provide and install appropriate mineral wool material inside fire rated frames prior to erection
 - 2. Grouting:
 - a. Refer to INSTALLATION heading for exterior frames
- ### 3.5 INSTALLATION
- A. General:
 - 1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 - a. Installed metal doors, door frames and window lite frames and accessories in accordance with drawings, reviewed Shop Drawings, manufacturer's data, and as specified here.

- b. Hang with clearance indicated in Section 08 71 00 - Door Hardware. Install in accordance with HMMA 840 and 861.
- 2. All interior metal frames shall be;
 - a. Filled with insulating foam at non rated conditions
 - 1) Brace frames to eliminate any potential bowing of frame.
 - b. Filled with mineral wool at rated conditions
- 3. All exterior metal frames shall be;
 - a. Painted inside frame with barrier coating.
 - b. Fully grouted after barrier coating applied and cured.
 - 1) Brace frames to eliminate any potential bowing of frame.
 - c. Holes in frame filled, bondo filled, sanded smooth and finished after grouting.
- 4. Prime coat touch-up;
 - a. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer in accordance with Section 09 90 00.
- 5. Finish paint frames after installation, refer to Painting Section 09 90 00.
- 6. Except for frames located at in-place concrete or concrete block which can be installed after wall is placed, place frames prior to construction of enclosing walls and ceilings.
 - a. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.
 - 1) After wall construction is completed, frames are grouted or filled with appropriate material, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
- B. Anchorage:
 - 1. Frame anchors shall be located on each jamb starting 4" from top and 24" on center maximum on down with floor anchor at base. Provide anchors at head not more than 24 inches on center and not less than two per door head.
 - 2. Anchors shall be 14 ga. galvanized steel of size and length or shape required by construction.
 - 3. Anchor to floors:
 - a. 12 gauge galvanized angles welded to bottom of each door jamb and vertical mullions with two holes in bottom leg for 1/4 inch wedge anchor each.
 - 4. Anchor to block or concrete walls
 - a. UL approved wedge anchor at dimpled holes centered on stop face of frame jambs and/or head.
 - 5. Comply with NAAMM Standard, HMMA 840, current published edition.
- C. Fully grout all exterior steel frames:

1. Grouting:
 - a. Provide and install appropriate mortar material for all exterior frames.
 - b. Pre treat inside of frame as part of fabrication with barrier coating.
 2. Sound deadening:
 - a. Refer to FABRICATION heading for interior frames
- D. Install Metal Doors
1. Inspection:
 - a. Examine door frames and verify that they are of the correct type and have been installed as required for proper hanging of corresponding doors.
 - 1) Correct conditions detrimental to the proper and timely installation of plastic faced wood doors; do not proceed with installation until unsatisfactory conditions have been corrected.
 2. Installation:
 - a. Install doors and fit hardware to doors in accordance with manufacturer's instructions.
 - b. Fit doors to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.
 - c. Replace doors which have been improperly prepared at factory and which cannot be adjusted without damage to surfaces.
 - d. Clearances: (Unless otherwise required by testing labeling of rated doors and mfgr. to be different)
 - 1) For non-fire-rated doors provided clearances of;
 - a) 1/8" at jambs and head
 - b) 1/8" at meeting stiles for pairs of door
 - c) 1/2" from bottom of door to top of decorative floor finish or covering.
 - i. Except where threshold is shown or scheduled provided 1/4" clearance from bottom of door to top of threshold.
 - e. Fire-rated doors:
 - 1) Install in corresponding fire-rated frames in accordance with the requirements of NFPA Standard No. 80.
 - 2) Provide clearances complying with the limitations of the authority having jurisdiction.
 - f. Operation:
 - 1) Re-hang or replace doors which do not swing or operate freely.
 - 2) Replace doors damaged during installation.
 - g. Folding, Bi-parting, sliding and other specialty door shall be installed in accord with indicated details, reviewed shop drawings and manufacturer's recommendations.

- h. Location of finishes and hardware as listed and detailed shall be used as a guide and shall be field verified to achieve a smooth and effortless operation.

3.6 ADJUSTING

- A. Hardware adjustment shall be done by others under hardware specifications section.

3.7 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 - 1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 - 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.8 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 08 11 13

SECTION 08 14 00 – WOOD DOORS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the Owner's General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Door schedule:
 - a. Interior
 - 2. Wood frames

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. Leadership in Energy and Environmental Design (LEED), www.usgbc.org/LEED (United States Green Building Council (USGBC))
 - 1. Refer to Division 1 for version of LEED Rating System and Reference Guide applicable to project.
- E. Collaborative for High Performance Schools (CHPS), www.chps.net
- F. American National Standards Institute (ANSI), www.ansi.org
 - 1. ANSI/WDMA I.S.1-A SERIES (Latest edition) Industry Standard for flush wood doors
- G. American Society For Testing and Materials (ASTM), www.astm.org
 - 1. ASTM E152 - Methods of fire tests for wood doors
 - 2. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies (to Standard Grade 30)
- H. Forest Stewardship Council (FSC) www.fsc.org
- I. International Code Council Evaluation Service (ICC-ES), www.icc-es.org
- J. National Fire Protection Agency (NFPA), www.nfpa.org

1. NFPA 80 – Labeled Protective assemblies
 2. NFPA 105 – Installation of Smoke and Draft Control of 20 minute labeled door assemblies
 3. NFPA 252 – Smoke and Draft Control of 20 minute labeled door assemblies
 4. NFPA 257 – Glazing in Fire Rated Door Assemblies
 5. NFPA 288 – Floor Fire Door Assemblies
- K. Warnock-Hersey International (WH)
- L. Window and Door Manufacturers Association, (WDMA), www.wdma.org
1. WDMA Quality Standard: I.S.1A "Architectural Wood Flush Doors", of Window and Door Manufacturers Association (WDMA).
 2. WDMA Quality Standard: I.S.1A "Architectural Wood Flush Doors", of Window and Door Manufacturers Association (WDMA).
- M. Woodwork Institute, (WI), www.woodworkinstitute.com.
1. WI Manual of Millwork, Section 12, Architectural Flush Wood Doors
- N. Underwriters Laboratory (UL), www.ul.com

1.3 PERFORMANCE

A. General:

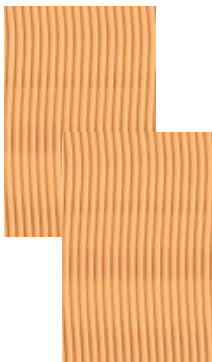
1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Testing shall be done as herein specified and as listed in drawings.
5. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Door / Frame Assembly: Rated Assembly	General	Comply	UL 10A, 10C, 14B, 14C & WDMA I.S.1A, Item C-8
	Positive Pressure	"S" Label compliance – (After 5 minutes into test, the neutral pressure plane should be at 40" Temperature rise at 250 degrees)	UL, CBC
	Smoke & Draft Control	Comply	UL 1784 & WDMA I.S.1A, Item P-3
	Fire Rated Assembly	Comply	CBC 711.8, 715.4 & table 715.4 & WDMA I.S.1A, Item P-3

	Fire Rated Corridors and Smoke Barriers / Smoke Control	Comply	CBC 715.4.3 & 715.4.3.1
	Fire Rated Assemblies, Exit Enclosures & Exit Passageways	Comply	CBC 715.4.4 & 715.4.4.1
	Glazing in Doors	Comply	CBC 715.4.4.1
	Labeling of Protective Openings	Comply	CBC 715.4.5 & 715.4.5.1 & 715.4.5.3
Door Construction	Construction Performance Testing	Comply	WDMA IS 1A
	Construction type	Heavy Duty construction	
	Dimensional Tolerances	Width: +/-1/16" not prefit +/-1/32" factory prefit Height:: +/-1/16" Thickness: +/-1/16"	WDMA I.S.1A, Item P-3
	Hardware matching tolerances	Comply	
	Vertical & Horizontal Edge material	Wood veneer to match face of door	WDMA I.S.1A, Item C-4 & P-1
	Vertical & Horizontal Edge bonding	Bonded assembly	WDMA I.S.1A, Item C-5
	Adhesive	Type II, minimum	WDMA I.S.1A, Item C-6
	Core and Wood Blocking	Wood veneer Particleboard Core: PC-5 & HB-3 & HB-8 Wood veneer Fire Resistant Core: FD-45/60/90-5 & HB-3 & HB-8	WDMA I.S.1A, Item C-10
		Wood veneer HPDL Particleboard Core: PC-5 & HB-3 & HB-8 Wood veneer HPDL Fire Resistant Composite Core: FD-45/60/90-5 & HB-3 & HB-8	WDMA I.S.1A, Item C-11
Face Veneer:	Grade: Transparent Finish	Premium Grade Door: Veneer for Transparent finish <ul style="list-style-type: none"> Veneer is required to be of sufficient thickness (minimum 1/50" at 12% MC) to preclude sand-through, show-through of core, and glue bleed. UV set sealers applied twice and sanded in between Finish coat applied last Protective peel off film applied for protection 	WDMA I.S.1A, Item A-8 & C-1 WI – Woodwork Institute

	Grade: Designation	<p>Grade A: (All species except as herein listed)</p> <ul style="list-style-type: none"> • The Veneer shall be smooth, tight-cut and full-length. • When the face consists of more than one Veneer component or piece, the edge shall appear parallel and be edge matched. • Species specified for natural color will allow color contrasts, but must be book matched, unless otherwise specified. • The components of plain-sliced (flat-cut) will be book matched, unless otherwise specified with a running, balanced, or center matched arrangement. • Unless otherwise specified, components in plain-sliced faces will have a matching arrangement selected by the manufacturer. • Plain-sliced faces will consist of two or more components with no component less than 152mm (6 inches) wide except for outside components which may be less than 152mm (6 inches) to allow for certain types of matching or panel edge trim loss. • No plain-sliced components will have a split heart. • Not full quarter-cut is allowed in plain-sliced faces. • The width of any single component in quarter-cut, rift-cut or comb grain faces shall not be less than 76mm (3 inches) except for outside components which may be less than 76mm (3 inches) to allow for certain types of matching or door edge trim loss. 	
		Grade AA: Oak & African Mahogany	
		Grade B: White Maple	
	Matching Spliced veneers	<p>Running & Continuous</p> <p>Matching</p> <ul style="list-style-type: none"> • Plain Sliced (flat cut): Book match • Quarter Cut Sliced: Slip match • Rift Cut: Center match 	<p>WDMA I.S.1A, Item A-5</p> <p>WDMA</p>

	Appearance of doors in pairs - single	Pair Match	WDMA I.S.1A, Item A-6
	Appearance of pairs of doors in sets	Set Match	
	Appearance of multiple doors with transom	Continuous Match	WDMA I.S.1A, Item A-7
	Substrate Thickness	1/16" min.	
	Veneer matching	Room color matching in a single room - yes	WDMA I.S.-1-A
	Cherry	All heartwood	
	White Maple	All sapwood	
	Red Birch	Select heartwood	
	White Birch	Select sapwood	
	Cut/Species/Flitch	Reference Cut Types:	WDMA I.S.1A, Item A-3 & item A-6
	<p><u>Plain Sliced</u> (flat cut): Sliced parallel to a line through the center of the log, cathedral and straight-grained patterns result. Since individual pieces of veneer are kept in the order they're sliced, a natural grain progression results when assembled.</p> <ul style="list-style-type: none">4" flitch at A grade, 5" at AA grades & 3" at grade BAll species except oak		
	<p><u>Quarter Cut Sliced:</u> A series of stripes is the result of this cut, the width of which varies from species to species. A natural distribution of Ray Fleck (flake) is characteristic of this cut in red and white oak.</p> <ul style="list-style-type: none">3" min – 4" max flitch at grade A, AA & BAll species except oak		
	<p><u>Rift Cut:</u> This cut slices slightly across the medullary rays, accentuating the vertical grain and minimizing the 'flake'. Rift grain is restricted to red and white oak.</p> <ul style="list-style-type: none">3" min – 4" max flitch at grades A, AA & BOak species only		
Door finish	Application	Factory unless noted otherwise	

	Factory Finish System	Comply	WDMA I.S.1A, Item F-1 & F-7
	Finish Selection	Comply	WDMA I.S.1A, Item F-2
	Finish System Description	Comply	WDMA I.S.1A, Item F-3
	System	TR-6, Catalyzed Polyurethane	WDMA I.S.1A, Item F-3
	Job site finishing	Not allowed	WDMA I.S.1A, Item F-5
Finish/Veneer Blemishes	Glue Spots	Not permitted	WDMA I.S.1A, Item F-6
	Finish runs, orange peel, blisters, blushing, cracking, sags and checking		
	Fine Sanding Scratches	Not noticeable at a distance of 3'-0" from surface of door	
	Filled holes or splits		
	Repair or touchup		
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. Construction Testing:

Item	Name of Test	Performance Results	Testing Std.
Door Hanging	Doors hung	Doors are square within the frame opening and swing freely. (Coordinate with Hardware installation)	N/A

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Submit Manufacturers data and shop drawings.
 1. Refer to drawings for dimension of door and frame opening, type and configuration.
- E. Submit Samples:
 1. Provide 3 samples of each finish which illustrate door grain, finish and color range.

- a. Standard: WDMA I.s.1a, Item F-4
- b. Items:
 - 1) Color
 - 2) Grain
 - 3) Texture
 - 4) Matching
- 2. One 6" x 6" of each glass type
- 3. Glazing tape
- F. Certification:
 - 1. Fire rating of glass, doors, frames and glass lite frames
 - 2. Sustainability criteria

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **Five (5)** years providing / installing / finishing similar size projects and complexity.
- C. Manufacturer shall have been in business for **Five (5)** years providing/installing/finishing similar size projects and complexity.
- D. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid
- E. Stipulations:
 - 1. Manufacture all labeled frames in strict accordance with the specifications and procedures of Underwriters Laboratories, Inc. (UL).
 - 2. Doors shall bear the Fire resistive labels conforming to UL or W.H. requirements and doors shall bear the label for Positive Pressure compliant fire-resistive rating and smoke rating indicated.
 - a. Wood frames shall bear fire rated label.
 - b. Doors shall bear the WDMA Quality Marking:
 - 1) Mark each wood door with WDMA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of WDMA I.S. 1A Series
 - 3. Natural veneers with sapwood and heartwood combined are not allowed.
 - 4. Natural maple veneer is not allowed.
 - 5. Do not leave Cherry & African mahogany veneer doors exposed to sunlight until hung in place.

- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 - 1. Agenda for meeting shall include, but not be limited to;
 - 2. Preparation for hardware
 - 3. Electrified hardware, power supply, conduit and wiring
- G. Miscellaneous criteria:
 - 1. Templates shall be furnished by hardware supplier for preparing shop drawings and for preparing and reinforcing hollow metal work to receive hardware.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Store doors and frames at building site under cover. Place units upright on at least 4 inch high wood sills in a manner that will prevent rust and damage.
 - 1. Avoid the use of non-vented plastic or canvas shelters which could create a humidity chamber.
 - 2. If cardboard wrapper on door or frames becomes wet, remove the carton immediately.
 - 3. Provide a space between stacked doors to promote air circulation.
 - 4. Furnish:
 - a. Prefinished doors shall be poly wrapped.
 - b. Unfinished doors supply with slip-sheets, poly wrapped or individually cartooned.
 - 5. Storage & Protection:
 - a. Comply with requirements in AWI section 1300-G-23 and NWWDA I.S 1 A How to store, handle, finish, install and maintain wood doors.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.

- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **District** within the warranty period, such defects shall be repaired and replaced at no cost to the **District**.
- C. Furnish door manufacturer's additional **Lifetime** warranty for interior doors and 2 year warranty for exterior doors agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship including, but not limited to: warping, delamination and telegraphing.
 - 1. Upon notification of District within the warranty period, such defects shall be repaired and replaced at no cost to the District.
 - 2. Warranty shall include repairing, replacing or refunding, and allow for reasonable re-hanging and refinishing charges of manufacturer's defective doors and wood frames, where defects were not visible when hung.
 - 3. Guarantee period shall be life of installation for doors and wood frames.
 - a. Guarantee shall cover replacement of door plus costs of hardware installation, hanging and finishing.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Wall construction and finishes
 - 2. Hardware installation
 - 3. Windows
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 08 11 13 – Steel Doors & Frames
 - 3. Section 08 17 43 – FRP Doors
 - 4. Section 08 71 00 – Door Hardware
- C. Related Documents include, but are not limited to the following:
 - 1. Division 1 Supplementary Conditions

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. **General Contractor** shall coordinate that Finish Hardware templates are furnished by hardware supplier for preparing shop drawings and for preparing and reinforcing doors to receive hardware.

1.13 EXTRA MATERIAL

- A. Submit as part of project closeout:
 - 1. Provide extra material for each product type, color, finish, etc. in same lot as installed product.
 - a. Furnish written certification that extra materials supplied have been inspected and reconfirmed to be the same as those used in the Work.
 - 2. Provide extra material in unopened fully labeled containers.
 - a. Do not supply anything less the full carton containers.
 - b. Furnish in factory packaged and labeled cartons and identify cartons with Project name.
 - c. Deliver materials to project premises just prior to substantial completion, and store at location directed by the **District**.
 - 3. Provide the following:
 - a. 1 gallon of each stain color used
 - b. 1 gallon of each clear coat used

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 - 1. Schedule:
 - a. Interior Doors:
 - 1) FLUSH PANEL – SOLID CORE WOOD DOOR
 - a) Oregon Door, Inc., www.oregondoor.com 1-800-722-7269
 - b) Marshfield, www.marshfielddoors.com
 - c) Mohawk Flush Doors, Inc. www.mohawkdoors.com (770) 493-8811
 - d) Eggers Industries, www.eggersindustries.com 920/793-1351
 - e) Haley Architectural Wood Doors, www.haleybros.com 1-714-670-2112

- f) Door America, www.dooramerica.com, ABS – American Building Supply, 888.454-2888
- 2) FLUSH PANEL - ACOUSTICAL RATED SOLID CORE WOOD DOOR
 - a) Haley Architectural Wood Doors, www.haleybros.com 1-714-670-2112
 - b) Marshfield, www.marshfielddoors.com
 - c) Eggers Industries, www.eggersindustries.com 920/793-1351
 - d) Mohawk Flush Doors, Inc. www.mohawkdoors.com (770) 493-8811
 - e) Door America, www.dooramerica.com, ABS – American Building Supply, 888.454-2888
- 3) STILE AND RAIL- SOLID CORE WOOD DOOR
 - a) Sierra Pacific, www.sierrapacificdoor.com
 - b) Architectural Traditions, www.swdoor.com, www.architecturaltraditions.com
 - i. Contact: (916) 660-9991, Rocklin, CA.
 - c) Tru-Stile Doors www.trustile.com
 - d) Woodtech Trading Company, www.woodtechdoor.com (800) 775-1352
 - e) Eggers Industries, www.eggersindustries.com 920/793-1351
 - f) The Maiman Company, www.maiman.com (800) 641-4320
 - g) Door America, www.dooramerica.com, ABS – American Building Supply, 888.454-2888
- 4) FULL LITE - STILE AND RAIL SOLID CORE WOOD DOOR
 - a) Sierra Pacific, www.sierrapacificdoor.com
 - b) Architectural Traditions, www.swdoor.com, www.architecturaltraditions.com
 - i. Contact: (916) 660-9991, Rocklin, CA.
 - c) Tru-Stile Doors www.trustile.com
 - d) Woodtech Trading Company, www.woodtechdoor.com (800) 775-1352
 - e) Eggers Industries, www.eggersindustries.com 920/793-1351
 - f) The Maiman Company, www.maiman.com (800) 641-4320
- 5) MULTIPLE LITES - STILE AND RAIL SOLID CORE WOOD DOOR
 - a) Woodtech Trading Company, (800) 775-1352
 - b) Eggers Industries, 920/793-1351

- c) Tru-Stile Doors www.trustile.com
- d) Architectural Traditions, www.swdoor.com, www.architecturaltraditions.com
 - i. Contact: (916) 660-9991, Rocklin, CA.
- b. Door Frames: (Interior and Exterior):
 - 1) Metal frames, refer to specific frame specification section.
 - 2) Wood frame
 - a) Fabricated to match details
 - 3) Wood frame – fire rated
 - a) Eggers
 - b) Woodtech
- 2. Reviewed Equivalent by **Architect**.
 - a. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - b. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS - DOOR SCHEDULE - INTERIOR

A. DOORS: FLUSH PANEL- SOLID CORE WOOD DOOR

- 1. Lacquered and color to match **Architect's** Custom Color
 - a. General
 - 1) Manufacturer: Oregon Door
 - 2) Model:
 - a) Standard: PC-5
 - b) FSC Core: FSC-PC-5
 - 3) Thickness: 1 ¾"
 - 4) Veneer:
 - a) Locations: Face-front & back and all Edges and Cross-banding
 - b) Grade: As herein specified

- 5) Matching: As herein specified
- 6) Core:
 - a) Mat formed 32lb. Solid Particleboard
 - b) ANSI: A208.1, Grade #1-LD-2
 - c) No added formaldehyde
 - d) FSC Certified:
 - i. 100% FSC particleboard core with chain of custody certification
 - ii. 100% Urea free
- 7) Ply's: 5
- 8) Standard: As herein specified
- 9) Adhesive: Type I Waterproof Bond – Core and veneer
- 10) Rails: "Firestop" – 1 3/8" Laminated Hardwood @ vertical edge
- 11) Stiles: "Firestop" – 1/4" Hardwood Matching Face Veneer after trim
- 12) Veneer:
 - a)

<u>Species:</u>	<u>Cut:</u>
i. White Maple	Quarter Cut Sliced
ii. English Maple	Quarter Cut Sliced
iii. White Birch	Quarter Cut Sliced
iv. Red Birch	Quarter Cut Sliced
v. Cherry	Quarter Cut Sliced
vi. African Mahogany	Quarter Cut Sliced
vii. American Black Walnut	Quarter Cut Sliced
viii. White Oak	Rift Cut
ix. Red Oak	Rift Cut
 - b) Grade: Custom Grade
- 13) Moisture: Kiln dried
- 14) Finish:
 - a) Finishing System:
 - i. System: As herein specified
 - ii. Application: Factory finished, uno.
 - a. Field finish if approved by **Architect**

- iii. Sheen: Semi-gloss Satin
- iv. Effect: Accommodate grain type
- v. WI Grade: Premium
- vi. Color: Custom color to match **Architect's** sample.

15) Sustainability:

- a) FSC Certified Core: [Specifier, edit model number based on core type]
 - i. No
 - ii. Yes

16) Door Lites:

- a) As herein specified
- b. Rating:
 - 1) Construction and compliance with standards to match designated fire rating and smoke design as indicated on Drawings and required per UL 10-C and UBC 7-2-1997.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

B. Door Construction

1. General requirements:

- a. Top and bottom Rails:
 - 1) Rails shall be as listed in Door Schedule herein specified, sized to accommodate hardware and & shall be hardwood.
 - 2) Mill option species solid lumber for rated and non-rated doors.
 - 3) Top rail shall be sized and fabricated to accommodate fastening of door closer hardware.
 - 4) Exposed smooth face of bottom rail shall be 10" height minimum.
 - 5) Edges shall be finished with veneer to match door face.
- b. Fire rated doors:
 - 1) Provide solid wood or Special Laminated Material with surface mounted hardware and closers, for attachment with screws, full threaded #12 x 1-1/2".
 - 2) Doors shall bear fire rated label as required per door schedule and rating of room servicing.
 - 3) Doors shall bear "Positive Pressure" label "S" for all rated conditions in compliance with building code, including but not limited to;

4) Mill option species solid lumber for rated and non-rated doors.\

C. Special Construction

1. Fire Blocking

- a. Provide manufacturers fire blocking within door assembly for screw, fastening of all surface hardware.
- b. No thru fasteners are acceptable.

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

A. Refer to Division 1 for project coordination requirements.

B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

1. Field-verify wall thickness to determine frame sizes.

3.3 PREPARATION

A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

A. General:

1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 - a. Install wood doors plumb and square.
 - 1) Prepare doors to receive hardware; hardware installation is specified in Section 08 71 00 – Finish Hardware.
 - b. Edges of doors shall be pre-finished to match face of doors; NO EXCEPTIONS.

- c. Fit doors with proper bevel and undersize to clearance indicated in "Door Clearance" and "Hardware Placement" articles in Hardware Section. Do not trim fitted doors more than 1/8 inch from any edge.
- B. Installation Tolerances
 - 1. Maximum diagonal distortion: Per Industry Standard Dimensional tolerances.
 - a. Warp: 1/8" in face on 3/6 X 7/0 or smaller door or any 3/6 X 7/0 section on larger doors
 - b. Telegraphing: 1/100" in any 3" span
 - c. Size: thickness, width, length +/- 1/16"
 - d. Prefit: +/- 1/32"
- C. Install Wood Doors
 - 1. Inspection:
 - a. Examine door frames and verify that they are of the correct type and have been installed as required for proper hanging of corresponding doors.
 - 1) Correct conditions detrimental to the proper and timely installation of plastic faced wood doors; do not proceed with installation until unsatisfactory conditions have been corrected.
 - b. Wood door frames: Coordinate with Section 06 20 00 – Finish Carpentry
 - 2. Installation:
 - a. General: Install doors and fit hardware to doors in accordance with manufacturer's instructions.
 - b. Fit doors to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.
 - c. Replace doors which have been improperly prepared at factory and which cannot be adjusted without damage to surfaces.
 - d. Clearances: (Unless otherwise required by testing labeling of rated doors and mfgr. to be different)
 - 1) For non-fire-rated doors provided clearances of;
 - a) 1/8" at jambs and head
 - b) 1/8" at meeting stiles for pairs of door
 - c) 1/2" from bottom of door to top of decorative floor finish or covering.
 - i. Except where threshold is shown or scheduled provided 1/4" clearance from bottom of door to top of threshold.
 - e. Fire-rated doors:

- 1) Install in corresponding fire-rated frames in accordance with the requirements of NFPA Standard No. 80.
 - 2) Provide clearances complying with the limitations of the authority having jurisdiction.
 - f. Operation:
 - 1) Re-hang or replace doors which do not swing or operate freely.
 - 2) Replace doors damaged during installation.
 - g. Folding, Bi-parting, sliding and other specialty door shall be installed in accord with indicated details, reviewed shop drawings and manufacturer's recommendations.
 - h. Location of finishes and hardware as listed and detailed, shall be used as a guide and shall be field verified to achieve a smooth and effortless operation.
- D. Install Louvers
1. Install in accordance with manufacturers recommendations

3.5 ADJUSTING

- A. Test operation of components, etc. and adjust as needed to produce fully functioning units that comply with requirements.

3.6 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
- B. The Installer shall be responsible for the proper application of the materials.
- C. The Installer shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.7 TESTING

- A. Swing of doors in frame
 1. General:
 - a. Perform tests witnessed by **District** and **Architect**.
 - b. Failing doors shall be replaced and repaired to meet test requirements at no additional cost to **District**.
 2. Fit of door
 - a. After door is hung, clearances, fit and trueness of door within frame shall be checked to confirm door sits square in frame and swings evenly without binding

3.8 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **District**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".
- J.

END OF SECTION 08 14 00

SECTION 08 17 43 - FRP DOORS

1. PART 1 GENERAL

2. SECTION INCLUDES

- a. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door
- b. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door installed in Aluminum Framing
- c. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door installed in Thermally Broken Aluminum Framing
- d. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door installed in Retrofit Aluminum Framing

3. RELATED SECTIONS

- a. Section 08 06 71 – Door Hardware Schedule
- b. Section 08 06 80 – Glazing Schedule
- c. Section 08 10 00 – Doors and Frames
- d. Section 08 71 00 – Door Hardware
- e. Section 08 91 26 – Door Louvers

4. REFERENCES

- a. AAMA 1304 – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
- b. ASTM-B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- c. ASTM-B221 – Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- d. ASTM-C518 – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
- e. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
- f. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.
- g. ASTM-D638 – Standard Test Method for Tensile Properties of Plastics.
- h. ASTM-D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- i. ASTM-D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- j. ASTM-D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- k. ASTM-D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- l. ASTM-D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- m. ASTM-D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
- n. ASTM-D3029 – Test Methods for Impact Resistance of Flat Rigid Plastic Specimens by Means of a Tup (Falling Weight) (Withdrawn 1995) (Replaced by ASTM-D5420).
- o. ASTM-D5116 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products.
- p. ASTM-D6670 – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.
- q. ASTM-E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- r. ASTM-E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

- s. ASTM-E330 – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- t. NFRC 100 – Procedure for Determining Fenestration Products U-Factors.
- u. NFRC 400 – Procedure for Determining Fenestration Products Air Leakage.
- v. TAS 201 – Impact Test Procedures.
- w. TAS 202 – Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
- x. TAS 203 – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

5. SUBMITTALS

- a. Must comply with Section 01 33 00 – Submittal Procedures.
- b. Action Submittals/ Informational Submittals.
 - i. Product Data.
 - 1. Submit manufacturer's product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
 - ii. Shop Drawings.
 - 1. Submit manufacturer's shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
 - iii. Samples.
 - 1. Submit manufacturer's door sample composed of door face sheet, core, framing and finish.
 - 2. Submit manufacturer's sample of standard colors for door face and frame.
 - iv. Testing and Evaluation Reports.
 - 1. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed in Section 2.04.
 - v. Manufacturer Reports.
 - 1. Manufacturer's Project References.
 - a. Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.
- c. Closeout Submittals.
 - i. Operation and Maintenance Manual.
 - 1. Submit manufacturer's maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.
 - ii. Warranty Documentation.
 - 1. Submit manufacturer's standard warranty.

6. QUALITY ASSURANCE

- a. Manufacturer's Qualifications.
 - i. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.
 - ii. Door and frame components must be fabricated by same manufacturer.
 - iii. Evidence of a documented complaint resolution quality management system.

7. DELIVERY, STORAGE, AND HANDLING

- a. Delivery.
 - i. Deliver materials to site in manufacturer's original, unopened, containers and packaging.

- ii. Labels clearly identifying opening, door mark, and manufacturer.
- b. Storage.
 - i. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.
- c. Handling.
 - i. Protect materials and finish from damage during handling and installation.

8. WARRANTY

- a. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
- b. Standard Period.
 - i. Ten years starting on date of shipment.
- c. Limited lifetime
 - i. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.
- d. Finish
 - i. Fluropan painted aluminum: 10 years.
 - ii. Painted SL-17, SL-18, SL-19, SL-20 face sheets: 5 years.
 - iii. Painted AF-100, AF-200, AF-150 frames, AF-250 frames: 3 years.
 - iv. Painted FR doors: 3 years.
 - v. Stained SL-18 and SL-9 face sheets: 5 years.
 - vi. Anodized, aluminum: 10 years.
 - vii. Thresholds do not have a finish warranty.

2. PART 2 PRODUCTS

1. FRP/ALUMINUM HYBRID DOORS

- a. Manufacturer.
 - i. Special-Lite, Inc.
 - 1. PO Box 6, Decatur, Michigan 49045.
 - 2. Toll Free (800) 821-6531, Phone (269) 423-7068, Fax (800) 423-7610.
 - 3. Web Site www.special-lite.com.
 - 4. E-Mail info@special-lite.com.

2. DESCRIPTION

- a. Model.
 - i. SL-20 Sandstone Texture FRP/ Aluminum Hybrid Door.
- b. Door Opening Size.
 - i. 3'-0" W x 7'-0"H
- c. Construction.
 - i. Door Thickness.
 - 1. 1-3/4".
 - ii. Stiles & Rails.
 - 1. Aluminum extrusions made from 6063 aluminum alloys with a minimum temper of T5.

2. Minimum 2-5/16" deep one-piece extrusion with have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
 3. Screw or snap in place applied caps are not acceptable.
 4. Top rails must have integral legs for interlocking continuous extruded aluminum flush cap.
 5. Bottom rails must have integral legs for interlocking continuous weather bar with single nylon brush weather stripping or manually adjustable SL-301 door bottom with two nylon brush weather stripping.
 6. Meeting stiles to include integral pocket to accept pile brush weather seal.
- iii. Corners.
1. Mitered.
 2. Secured with 3/8" diameter full-width steel tie rod through extruded splines top and bottom which are integral to standard tubular shaped rails.
 3. 1-1/4" x 1-1/4" x 3/16" 6061 aluminum angle reinforcement at corner to give strong, flat surface for locking hex nut to bear on.
 4. Weld, glue, or other methods of corner joinery are not acceptable.
- iv. Core.
1. Poured-in-place polyurethane foam.
 2. Laid in foam cores are not acceptable.
 3. Foam Plastic Insulated Doors: IBC 2603.4.
 - a. Foam plastic shall be separated from the interior of a building by an approved thermal barrier.
 - b. Approved thermal barrier must meet the acceptance criteria of the Temperature Transmission Fire Test and Integrity Fire Test as stated in NFPA 275.
 - c. IBC 2603.4.1.7 foam plastic insulation, having a flame spread index less than 75 and a smoke developed index of not more than 450 shall be permitted as a door core when the face is metal minimum 0.032" aluminum or 0.016" steel.
 - d. Standard door assembly can be tested to show it meets these requirements without the use of thermal barrier. If no independent testing conducted all doors with foam plastic core must have a thermal barrier.
- v. Face Sheet.
1. Exterior
 - a. 0.120" thick, Sandstone texture, through color FRP sheet.
 - b. Optional painted finish consult manufacturer.
 - c. Class C standard.
 2. Interior
 - a. 0.120" thick, Sandstone texture, through color FRP sheet.
 - b. Optional painted finish consult manufacturer.
 - c. Class C standard optional Class A available consult manufacturer.
 3. Attachment of face sheet.
 - a. Extruded stiles and rails to have integral reglets to accept face sheet on both interior and exterior side of door which secure face sheet into place and permit flush appearance.
 - b. Use of glue to bond face sheet to core or extrusions is not acceptable.
- vi. Cutouts.

1. Manufacture doors with cutouts for required vision lites, louvers, and panels.
- vii. Hardware.**
 1. Pre-machine doors in accordance with templates from specified hardware manufacturers.
 2. Surface mounted closures will be reinforced for but not prepped or installed at factory.
 3. Factory install door hardware.
- viii. Reinforcements.**
 1. Aluminum extrusions made from 6061 or 6063 aluminum alloys.
 2. Sheet and plate to conform to ASTM-B209.
 3. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
 4. Bars and tubes to meet ASTM-B221.
- d. Sustainability Characteristics.**
 - i. LEED Declaration.**
 1. Entrance Products contribute to point calculations for the following credits:
 - a.** MR Credit 4.1 Recycled Content 10% (post-consumer = ½ pre-consumer) 1 point.
 - b.** MR Credit 4.2 Recycled Content 20% (post-consumer = ½ pre-consumer) 1 point.
 2. All aluminum extrusions are produced using prime-equivalent billet produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes. The USGBC classifies these extrusions as pre-consumer recycled material.
 3. Manufacturing facility located within 500 miles of major components and materials, including aluminum extrusions.
 4. The point of recovery and smelting of pre-consumer recycled material within 500 miles of the manufacturing facility.

3. FRAMING

- a. Framing**
 - i. Aluminum Tube Framing with Applied Stops.**
 1. Model.
 - a. SL-50.
 2. Materials.
 - a. See 2.05.A.
 3. Perimeter Frame Members.
 - a. Box type with 4 enclosed sides.
 - b. Factory fabricated.
 - c. Open-back framing is not acceptable.
 4. Applied Door Stops.
 - a. 5/8" x 1-1/4" or 5/8" x 1-3/4", 0.125" wall thickness, with screws and weather-stripping.
 - b. Provide solid ½" aluminum bar behind door stop for closer shoe attachment.
 - c. Pressure gasketing for weathering seal.
 - d. Counterpunch fastener holes in door stop to preserve full-metal thickness under fastener head.
 5. Caulking.
 - a. Caulk joints before assembling frame members.
 6. Frame Member to Member Connections.

- a. Secure joints with fasteners.
 - b. Provide hairline butt joint appearance.
 - 7. Hardware
 - a. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
 - b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
 - c. Factory install door hardware.
 - 8. Anchors:
 - a. Anchors appropriate for wall conditions to anchor framing to wall materials.
 - b. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
 - c. Secure head and sill members of transom, side lites, and similar conditions.
- ii. Retrofit Framing.
 - 1. Model.
 - a. SL-1031.
 - 2. Materials.
 - a. See 2.05.A.
 - 3. Insert frame as indicated on the Drawings, using integral stop fitted with weather-stripping.
 - 4. Corner joints of miter design, secure with furnished aluminum clips, and screw into place.
 - 5. Hardware.
 - a. Pre-machine and reinforce insert frame members for hardware in accordance with manufacturer's standards and hardware schedule.
 - b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
 - c. Factory install hardware.
 - 6. Anchors.
 - a. Anchors of suitable type to fasten insert framing to existing frame materials.
 - b. Minimum of 5 anchors on jambs up to 7'-4" height, 3 anchors on headers, and 1 additional anchor for each additional foot of frame.
- iii. Capping.
 - 1. Model.
 - a. SL-70
 - 2. Materials.
 - a. See 2.05.A.
 - b. Size as indicated on drawings.
- iv. AF-150.
 - 1. Jamb Depth.
 - a. Custom size, see drawings.
 - 2. Materials.
 - a. See 2.05.A.
 - 3. Perimeter Frame Members.
 - a. 1/4" thick pultruded fiberglass open throat with return.
 - b. Factory fabricated.
 - c. 2" or 4" face available for frame headers.

4. Transoms and Sidelites.
 - a. Same as perimeter frame members.
 - b. Removable stop for 1/4", 5/8" or 1" glass or panels.
5. Integral Door Stops.
 - a. 5/8" x 2-1/4".
6. Frame Assembly.
 - a. Standard knock down.
 - b. Optional chemically welded consult factory for details.
7. Frame Member to Member Connections.
 - a. Corners mitered with 4" x 4" x 3/8" pultruded FRP angle reinforcement with interlocking pultruded FRP brackets.
 - b. All member to member connections knocked down at factory unless chemically welded at factory requested.
 - c. Provide hairline butt joint appearance.
8. Reinforcements.
 - a. Standard.
 - i. 1/4" thick pultruded FRP chemically welded to frame at all hinge, strike, and closer locations.
 - b. Optional.
 - i. Aluminum, contact factory for details.
9. Hardware
 - a. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
 - b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
10. Anchors:
 - a. Masonry.
 - i. Existing concrete or block punch and dimple.
 - ii. Sill anchor.
 - iii. Concealed existing masonry anchor.
 - iv. Fiberglass masonry t anchor.
 - b. Drywall.
 - i. Standard jamb anchor tuck.
 - ii. KD wrap.
 - iii. Optional punch and dimple tuck with either metal or wood studs.
- v. AF-250.
 1. Jamb Depth.
 - a. 5-3/4".
 2. Materials.
 - a. See 2.05.A.
 3. Perimeter Frame Members.
 - a. 3/16" thick pultruded fiberglass open throat with return.
 - b. Factory fabricated.
 - c. 2" or 4" face available for frame headers.
 4. Integral Door Stops.
 - a. 5/8" x 2-1/4".
 5. Frame Assembly.
 - a. Standard knock down.
 - b. Optional chemically welded consult factory for details.

6. Frame Member to Member Connections.
 - a. Corners mitered with 2" x 2" x 1/4" pultruded FRP angle reinforcement with interlocking pultruded FRP brackets.
 - b. All member to member connections knocked down at factory unless chemically welded at factory requested.
 - c. Provide hairline butt joint appearance.
7. Reinforcements.
 - a. 1/4" thick pultruded FRP chemically welded to frame at all hinge, strike, and closer locations.
8. Hardware
 - a. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and door hardware schedule.
 - b. Surface mounted closures will be reinforced for but not prepped or installed at factory.
9. Anchors:
 - a. Masonry.
 - i. Existing concrete or block punch and dimple.
 - ii. Sill anchor.
 - iii. Concealed existing masonry anchor.
 - iv. Fiberglass masonry t anchor.
 - b. Drywall.
 - i. Punch and dimple for metal or wood studs.

4. PERFORMANCE

a. Face Sheet.

- i. Standard Interior and Exterior Class C 0.120" thick, Sandstone texture, through color FRP sheet.
 1. Flexural Strength, ASTM-D790: 27×10^3 psi.
 2. Flexural Modulus, ASTM-D790: 0.7×10^6 psi.
 3. Tensile Strength, ASTM-D638: 18×10^3 psi.
 4. Tensile Modulus, ASTM-D638: 1.0×10^6 psi.
 5. Barcol Hardness, ASTM-D2583: 40.
 6. Izod Impact, ASTM-D256: 7.0 ft-lb/in.
 7. Gardner Impact Strength, ASTM-D5420: 30 in-lb.
 8. Water Absorption, ASTM-D570: 0.16%/24hrs at 77°F.
 9. Surface Burning, ASTM-E84: Flame Spread ≤ 200 , Smoke Developed ≤ 450 .
 10. Chemical Resistance.
 - a. Excellent Rating.
 - i. Acetic Acid, Concentrated.
 - ii. Acetic Acid, 5%.
 - iii. Bleach Solution.
 - iv. Detergent Solution.
 - v. Distilled Water.
 - vi. Ethyl Acetate.
 - vii. Formaldehyde.
 - viii. Heptane.
 - ix. Hydrochloric Acid, 10%.
 - x. Hydrogen Peroxide, 3%.
 - xi. Isooctane.

xii. Lactic Acid, 10%.

11. USDA/FSIS Requirements.

- a. FRP face sheet with surfaseal is a finished outer surface material that is rigid; durable; non-toxic; non-corrosive; moisture resistant; a light, solid color such as white; easily inspected; smooth or an easily cleaned texture.
- b. FRP face sheet with surfaseal does not contain any known carcinogen, mutagen, or teratogen classified as hazardous substances; heavy metals or toxic substances; antimicrobials; pesticides or substances with pesticidal characteristics.

ii. Optional Interior Face Only Class A 0.120" thick, Sandstone texture, through color FRP sheet.

- 1. Flexural Strength, ASTM-D790: 14×10^3 psi.
- 2. Flexural Modulus, ASTM-D790: 0.4×10^6 psi.
- 3. Tensile Strength, ASTM-D638: 7×10^3 psi.
- 4. Tensile Modulus, ASTM-D638: 0.8×10^6 psi.
- 5. Barcol Hardness, ASTM-D2583: 45.
- 6. Izod Impact, ASTM-D256: 4.0 ft-lb/in notched.
- 7. Water Absorption, ASTM-D570: 0.16%/24hrs at 77°F.
- 8. Surface Burning, ASTM-E84: Flame Spread ≤ 25 , Smoke Developed ≤ 450 .
- 9. Taber Abrasion Resistance, Taber Test: 0.036% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.

b. Door Core.

- i. Density, ASTM-D1622: ≤ 5.0 pcf.
- ii. Compressive Properties, ASTM-D1621: Compressive Strength ≥ 60 psi, Compressive Modulus ≥ 1948 psi.
- iii. Tensile and Tensile Adhesion Properties, ASTM-D1623: Tensile Adhesion, 3" x 3" FRP Facers ≥ 53 psi, Tensile Adhesion, 1" x 1" Foam ≥ 104 psi.
- iv. Thermal and Humid Aging, ASTM-D2126: Volume Change at 158 °F, 100% humidity, 14 days $\leq 13\%$.
- v. Thermal Conductivity, ASTM-C518, Thermal Resistance ≥ 0.10 m²K/W.

c. Door Panel.

- i. Indoor Air Quality, ASTM-D5116, ASTM-D6607: GreenGuard, GreenGuard Gold.

d. Door and Aluminum Tube Frame Assembly.

- i. Structural Performance, ASTM E-330.
 - 1. Single or Pair of Doors, 6'4" x 7'2" overall size, single point latching.
 - a. ± 90 psf design pressure, pass.

e. Door and Thermally Broken Aluminum Frame Assembly.

- i. Thermal Transmittance, NFRC 100.
 - 1. Opaque Swinging Door (< than 50% glass)
 - a. U-Factor = 0.33 Btu/hr-ft²-°F.
 - 2. Commercially Glazed Swinging Entrance Door (> than 50% glass)
 - a. U-Factor = 0.62 Btu/hr-ft²-°F.
- ii. Air Leakage, NFRC 400, ASTM-E283.
 - 1. Opaque Swinging Door (< than 50% glass)
 - a. 0.02 cfm/sqft @ 1.57 psf.
 - b. 0.02 cfm/sqft @ 6.24 psf.
 - 2. Commercially Glazed Swinging Entrance Door (> than 50% glass)
 - a. 0.22 cfm/sqft @ 1.57 psf.
 - b. 0.42 cfm/sqft @ 6.24 psf.

- iii. Sound Transmission, ASTM-E90: STC = 30, OITC = 30.
- f. Door and AF-150 Frame Assembly.
 - i. Thermal Transmittance, NFRC 100.
 - 1. Opaque Swinging Door (< than 50% glass)
 - a. U-Factor = 0.33 Btu/hr·ft²·°F.
 - 2. Commercially Glazed Swinging Entrance Door (> than 50% glass)
 - a. U-Factor = 0.58 Btu/hr·ft²·°F.
 - ii. Air Leakage, NFRC 400, ASTM-E283.
 - 1. Opaque Swinging Door (< than 50% glass)
 - a. 0.11 cfm/sqft @ 1.57 psf.
 - b. 0.07 cfm/sqft @ 6.24 psf.
 - 2. Commercially Glazed Swinging Entrance Door (> than 50% glass)
 - a. 0.03 cfm/sqft @ 1.57 psf.
 - b. 0.04 cfm/sqft @ 6.24 psf.

- g. AF-150 Framing.
 - i. Tensile Strength, ASTM-D638: 15,900 psi.
 - ii. Tensile Modulus of Elasticity, ASTM-D638: 1.58 x 10⁶ psi.
 - iii. Maximum Compressive Strength, ASTM-D695: 15,500 psi.
 - iv. Compressive Modulus of Elasticity, ASTM-D695: 6.7 x 10⁵ psi.
 - v. Flexural Strength, ASTM-D790: 39.3 x 10³ psi.
 - vi. Flexural Modulus, ASTM-D790: 1.23 x 10⁶ psi.
 - vii. Izod Impact, ASTM-D256: 8.1 ft-lb/in.
 - viii. Barcol Hardness, ASTM-D2583: 57.
 - ix. Specific Gravity, ASTM-D792: 1.45 @ 23 °C.
 - x. Density, ASTM-D792: 1445.6 kg.m³ @ 23 °C.
 - xi. Coefficient of Linear Expansion, ASTM-D696: 1.26 x 10⁻⁵ in/in/°F.
 - xii. Short Beam Strength, ASTM-D2344: 3,980 psi.
 - xiii. Fastener Withdrawal, ASTM-D1761: 924 lbs.
 - xiv. Percent Fiberglass: 60%.

5. MATERIALS

- a. Aluminum Members.
 - i. Aluminum extrusions made 6061 or 6063 aluminum alloys.
 - ii. Sheet and plate to conform to ASTM-B209.
 - iii. Alloy and temper to be selected by manufacturer for strength, corrosion resistance, and application of required finish, and control of color.
- b. Fiberglass.
 - i. See 2.02.C.5.
- c. Fasteners.
 - i. All exposed fasteners will have a finish to match material being fastened.
 - ii. 410 stainless steel or other non-corrosive metal.
 - iii. Must be compatible with items being fastened.

6. FABRICATION

- a. Factory Assembly.
 - i. Door and frame components from the same manufacturer.
 - ii. Required size for door and frame units, shall be as indicated on the drawings.
 - iii. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
 - iv. All cut edges to be free of burs.
 - v. Welding of doors or frames is not acceptable.

- vi. Maintain continuity of line and accurate relation of planes and angles.
- vii. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.
- b. Shop Fabrication
 - i. All shop fabrication to be completed in accordance with manufactures process work instructions.
 - ii. Quality control to be performed before leaving each department.

7. FINISHES

- a. Door.
 - i. Aluminum.
 - 1. Mill.
 - a. AA-M10C22A21-Flash.
 - 2. Anodizing.
 - a. Class 1 Anodizing, minimum 0.7 mils thick.
 - b. Architect to select from the full selection of colors
 - 3. Paint.
 - a. Aluminum.
 - i. Fluropan®.
 - 1. Topcoat.
 - a. 70% polyvinylidene difluoride (PVDF) resin, meets or exceeds all AAMA 2605 specifications
 - 2. Color.
 - a. Consult manufacturer.
 - ii. FRP Face Sheets
 - 1. Through color.
 - a. Architect to select from the full selection of colors.
 - 2. Painted.
 - a. Architect to select from the full selection of colors.
- b. Frame
 - i. Aluminum.
 - 1. Mill.
 - a. AA-M10C22A21-Flash.
 - 2. Anodizing.
 - a. Class 1 Anodizing, minimum 0.7 mils thick.
 - b. Architect to select from the full selection of colors.
 - 3. Paint.
 - a. Aluminum.
 - i. Fluropan®.
 - 1. Topcoat.
 - a. 70% polyvinylidene difluoride (PVDF) resin, meets or exceeds all AAMA 2605 specifications
 - 2. Color.
 - a. Consult manufacturer.
 - ii. Fiberglass.
 - 1. Two-component flexible acrylic urethane Satin topcoat. (STANDARD)
 - a. Architect to select from the full selection of colors.
 - b. Custom colors available consult manufacturer.
 - c. Excellent exterior durability.

- d. Unique, high-solids, high-build, multifunctional coating.
- e. Low VOC, Satin coating.
- f. Impact Resistance, ASTM D-4226 Minimum 1.2 in/lb/mil
- g. Color retention: $\leq 1\Delta$ (CIE L.a.b.), Montreal 45° South: 12 months
- h. Very good chemical resistance.

8. ACCESSORIES

- a. Vision Lites.
 - i. Factory Glazing.
 - 1. Model.
 - a. FL Standard.
 - 2. Glazing Thickness.
 - a. 1/4".
 - 3. Rectangular Lites.
 - i. Size, as indicated on drawings.
 - b. Rectangular Vision Lite Accessories.
 - i. Security Gate.
 - 1. SL-SG349.
 - a. Frame perimeter is 1" x 1" x 1/8" steel angle.
 - b. Gate material is 14-gauge steel sheet perforated with 1/4" diameter round holes.
 - ii. Vandal Screen.
 - 1. SL-SG350.
 - a. Frame perimeter is aluminum.
 - b. Screen material is 16-gauge stainless steel sheet perforated with 1/4" diameter round holes.
 - iii. Louvers.
 - 1. Size, as indicated on drawings.
 - 2. Factory installed.
 - 3. 1" thick Y-Type fixed blade, 12" minimum from the bottom of the door.
 - 4. Exterior side of louver shall be free of fasteners.
 - 5. Optional insect screen.
 - iv. Privacy Vision Panel
 - 1. SL-PVP.
 - a. Size.
 - i. NL - 8" x 30"
 - b. Glazing.
 - i. Overall glass thickness, 1".
 - ii. Outer glazing, 1/4" Tempered Safety Glass.
 - iii. Minimum Optical Transparency >72%.
 - c. Finish.
 - i. Select from manufacturers standard colors.
 - ii. Black Perimeter.
 - iii. White Perimeter.
 - v. Finish.
 - 1. Color.

- c. Other Shapes.
 - i. Attach drawing for vision lite shape.
- b. Flush Vision Panels
 - i. Model.
 - 1. FLush Vision Panel (SL-FVP)
 - ii. Size.
 - 1. NL - 8" x 30"
 - iii. Factory Installed
 - iv. Glazing.
 - 1. Overall thickness to match door, 1-3/4".
 - 2. Outer glazing, 1/4" Tempered Safety Glass.
 - 3. Minimum optical transparency >72%.
 - v. Finish.
 - 1. Select from manufacturers standard colors.
 - a. Black Perimeter.
 - b. White Perimeter.
 - vi. Sealant.
 - 1. Silicone structural glazing.
 - 2. Color to match perimeter.
 - vii. Privacy Louvers
 - 1. None
 - 2. 316-Grade Stainless Steel Handles.
- c. Hardware.
 - i. Pre-machine doors in accordance with templates from specified hardware manufactures and hardware schedule.
 - ii. Factory install hardware.
 - iii. Hardware Schedule.
 - 1. As specified in Section 08 71 00.
 - a. Hinges.
 - b. Locking Hardware.
 - c. Flush/ Surface Bolts.
 - d. Door Pulls.
 - e. Push Bars.
 - f. Concealed Prox. Reader.
 - g. Concealed adjustable bottom brush.
 - i. SL-301.
 - 1. Not for use with CVR type hardware.
 - h. Concealed adjustable meeting stile astragal.
 - i. Adjustable astragal by Special-Lite.
 - i. Mullions.
 - j. Thresholds.
 - i. Aluminum threshold by Special-Lite.
 - ii. Or reinstall (E) threshold per drawings

3. PART 3 EXECUTION

- 1. EXAMINATION
 - a. Examine areas to receive doors.
 - b. Notify architect of conditions that would adversely affect installation or subsequent use.
 - c. Do not proceed with installation until unsatisfactory conditions are corrected.

2. PREPARATION

- a. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3. ERECTION

- a. Install doors in accordance with manufacturer's instructions.
- b. Install doors plumb, level, square, true to line, and without warp or rack.
- c. Anchor frames securely in place.
- d. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.
- e. Set thresholds in bed of mastic and back seal.
- f. Install exterior doors to be weathertight in closed position.
- g. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.
- h. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

4. FIELD QUALITY CONTROL

- a. Manufacture's Field Services.
 - i. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

5. ADJUSTING

- a. Adjust doors, hinges, and locksets for smooth operation without binding.

6. CLEANING

- a. Clean doors promptly after installation in accordance with manufacturer's instructions.
- b. Do not use harsh cleaning materials or methods that would damage finish.

7. PROTECTION

- a. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 08 17 43

SECTION 08 51 13 – ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work including but not limited to:
 - 1. Aluminum full lite nail flange windows:
 - a. Custom sizes
 - b. Standard or specified anchorages, trim and attachments to substrates.
 - c. True divided lites with full captured muntins (snap-in roll framed bead not acceptable)
 - d. Including the following types:
 - 1) Fixed Window Units – 880 F.F. (beveled snap-on retainer clip **NOT** acceptable (sq. extruded bead)
 - 2. Provide insulated glazing units
 - 3. Provide accessories, weather stripping, latching & locking mechanisms, etc.
 - 4. Provide dual concealed flashing at all window and door openings.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- C. Title 24, Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM E283 - Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors
 - 2. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
 - 3. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential

- 4. ASTM E774 - Specification for Sealed Insulating Glass Units
- 5. ASTM C 1036 - Standard Specification for Flat Glass
- E. Test samples shall comply with requirements in AAMA 101V -86 for test samples size and methods.
- F. ANSI/AAMA 101-88 F-R25
 - 1. Wind loading = 77 m.p.h. Nominal Wind Speed
- G. National Glass Association (NGA), www.glass.org

1.3 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Submit Manufacturers data and shop drawings.
- E. Shop Drawings: Submit shop drawings with specified finish for each type of window specified and detailing for building substrate.
- F. Samples:
 - 1. Submit corner section with specified finish.
 - 2. Include 12" x 12" samples of all glazing types along with literature of quality of construction, and specified finish.
- G. Product Data:
 - 1. Submit manufacturer's product specifications, technical support data, installation and maintenance recommendations and standard details for each type of window unit required. Include finishing methods, hardware and accessories.
 - 2. Window flashing components and design.
- H. Quality Control Submittals:
 - 1. Certificates: Submit manufacturer's certifications indicating compliance with specified performance and design requirements, certification shall be by recognized, independent testing laboratory certifying that each required type of window complies with performance requirements indicated.

1.4 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Air Infiltration: Not more than 0.15 cfm per square foot of overall frame area at an inward test pressure of 1.57 psf.
- C. Water Penetration: No water penetration as defined in the test method at an inward test pressure of 3.0 psf.
- D. Structural Performance: No glass breakage, damage to hardware, permanent deformation that would impair operation of the unit, or residual deflection at a positive

(inward) and negative (outward) test pressure of 37.5 psf.

E. Material:

1. Frame & Sash – extruded aluminum alloy 6063-T5
2. Components & Accessories – stainless steel

1.5 DELIVERY, STORAGE, AND PRODUCT HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Deliver in original packaging, store off the ground, and protect from weather.
- C. Store units in an upright position in a clean and dry storage area.
- D. Prime or seal wood surfaces, including surfaces to be concealed by wall construction, if more than 30 days will expire between delivery and installation.

1.6 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures. Submit a written warranty, executed by the window manufacturer, agreeing to repair or replace units that fail in materials or workmanship for a period of 3 years after substantial completion. Materials and labor are to be covered in full by the manufacturer. Insulated glass units are 10-year pro-rated warranty.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 1. Complete instructions regarding operation of the equipment.
 2. Complete instructions regarding maintenance of the equipment, materials, finishes, etc.
 3. Refer to Division 1 for closeout submittal procedures.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer shall be subject for compliance with all requirements, provide products from the following list:
 1. Windows:
 - a. Kawneer Company Inc.
 - b. Kawneer Trifab VG 451T Windows - Fixed
 2. Window Flashing:
 - a. Fortifiber www.fortifiber.com
 - b. WR Grace www.grace.com
 3. Reviewed Equivalent by Architect.
 - a. Substitutions shall require Architect's approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.

- B. All specified materials indicated are as manufactured by: Kawneer and shall be installed according to current listed specification requirements.
- C. Refer to drawings, details, and other related specification section whether listed or not. Details shall set requirements for size and configuration of systems.

2.2 MATERIALS

- A. General: Comply with requirements of ANSI/AAMA 101 - 88
- B. Aluminum Structural Components:
 - 1. Extruded aluminum alloy shall be 6063-T5 for strength, corrosion resistance and application of required finish.
 - 2. Extrusion members are to be 0.060" in thickness for structural walls.
- C. Fasteners:
 - 1. Provide aluminum, non-magnetic steel, epoxy adhesive, or other materials warranted by the manufacturer to be non-corrosive and compatible with window members, trim, hardware, anchors and other components of the window units.
 - 2. Where fasteners screw-anchor into aluminum frame members less than 0.125" thick, reinforce the interior with aluminum to receive screw threads, or provide standard, non-corrosive, pressed-in, splined grommet nuts.
- D. Anchors, Clips and Window Accessories:
 - 1. Fabricate anchors, clips and window accessories of aluminum or non-magnetic stainless steel.
 - 2. Anchor clips and window accessories fabricated of hot-dip zinc coated steel or iron may be used for concealed work.
- E. Hardware:
 - 1. Provide the mfg's standard hardware fabricated from a corrosive-resistant material and of sufficient strength to perform its intended function.
 - 2. For application of exposed hardware, use fasteners that match the finish of the hardware being fastened.
 - 3. Rollers shall have stainless steel wheels with ball bearings encased within a polycarbonate housing.
 - 4. Lock shall be injection-molded polycarbonate with a spring-activated latch mounted in the meeting stile.
 - 5. Secondary lock shall be a two position concealed friction secured deadbolt mounted in the vent lock stile. The primary position locks the window vent fully closed. The secondary position locks the window vent open 2 inches for ventilation.
- F. Weather-stripping:
 - 1. Provide the mfg's compressible weatherstripping at each edge of each operating sash.
 - 2. Weatherstripping shall be concealed when sash is closed.
- G. Glazing Stops:

1. Provide glazing stops (beads) coordinated with glass section indicated. **(beveled snap on stop not acceptable)**
2. Finish glazing stops to be same finish and color as exterior window frame finish.

H. Glass & Glazing:

1. Provide the mfgr's standard:
 - a. Sealed insulated dual pane unit: (provide design to accommodate wind loading)
 - 1) Thickness: 3/4" overall
 - a) 3/16" low - E² exterior
 - b) 3/16" clear interior
 - 2) Standards:
 - a) Complies with ASTM E774 Level A and is at least 3/4" in overall thickness.
 2. Glass types / Glazing specifications:
 - a. No substitutions:

Type:	VL ^T	VL ^R	U-Value	SHGC	LSG
1. Sungate 400 (2) Clear	76%	14%	0.32/0.28	0.60	1.27

- b. Safety glass at locations indicated and in compliance with applicable local codes & CBC.
- I. Mullion types: (submit with shop drawings for Architects review and approval)
 1. Full lite design:
 - a. Fixed window – Basis of Design: Kawneer Company Inc.
 - 1) Frame: 4-1/2"
 - a) Head: Per Mfg. product binder
 - b) Vert. Mull.: Per Mfg. product binder
 - c) Sill: Per Mfg. product binder
 - d) Jamb: Per Mfg. product binder

J. Finishes:

1. Select from one of the following standard mfgr's finishes:
 - a. Factory Finish:
 - a) Kawneer Permanodic™ AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating Color: Custom color RAL 1032 to match existing campus window frames.

K. Window flashing

1. Three Component assembly:
 - a. Schedule:

- 1) 1st:
 - a) Mechanically attached first layer at jambs and sill of window opening;
 - i. Mfgr: Fortifiber
 - ii. Product: Moistop Flashing
 - iii. Width: 9"
 - iv. Fasteners: As approved by product manufacturer.
- 2) 2nd:
 - a) Sealant
 - i. Mfgr: Fortifiber
 - ii. Product: Moistop Sealant
 - iii. Width: 12"
 - iv. Fasteners: As approved by product manufacturer.
- 3) 3rd:
 - a) Self adhering waterproof membrane flashing installed over nail flange at jambs and head in shiplap fashion.
 - i. Mfgr: Fortifiber
 - ii. Product: E-Z Seal Flashing
 - iii. Width: 12"
 - iv. Fasteners: As approved by product manufacturer.
- 4) 4th:
 - a) Wall membrane installed over entire wall and butted to window.
 - i. Refer to wall material specification.

2.3 CONSTRUCTION

- A. All window frames shall be a minimum of 2 1/8" deep, with corners mortised and securely joined with double plated steel screws engaging integral extruded screw races. All frame joints shall be sealed.
- B. Window vents and fixed panels shall be assembled around the glass utilizing full channel vinyl gaskets. The frame corners are to be rigidly held with double plated steel screws engaging integral extruded screw races in the horizontal members. Vent weather-stripping shall be a single plane, and shall be polypropylene pile.
- C. Locking device of window shall be able to withstand a force of 300 pounds in any direction.

2.4 ACCESSORIES AND TRIM

- A. Installation Accessories:
 1. Nailing Fin: Typical at jambs, sill and head.

B. Weep System:

1. Provide rectangular weep holes located in the frame sill for effective drainage and moisture control.

C. Screen:

1. Provide bug screens at all operable vent locations, typ.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions: Before installation, verify that openings are plumb and square and of proper dimension. Report frame defects or unsuitable conditions to the **General Contractor** before proceeding.
- B. Acceptance: Beginning of installation means acceptance of existing conditions.

3.2 FABRICATION

- A. General: Fabricate window units to comply with indicated standards.
- B. Preglaze: Fabricate units at the factory for applications indicated.

3.3 INSTALLATION

- A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, accessories and other window components.
- B. Comply with reviewed shop drawings.
- C. Install sealant and related backing materials at perimeter of assembly in accordance with Section 07 92 00 – Sealants and Caulking. Do not use expansive foam sealant.
- D. Windows shall be factory sized to fit in framed opening.
- E. Windows shall be fabricated to rough opening size with ½" deductions automatically made, so that no calculations will be required.
- F. Opening panels must be closed and locked during installation. Windows must be installed level, plumb and square with ¼" clearance on all sides with weep holes at bottom.
- G. All windows shall be installed by skilled workmen, trained for this type of work.
- H. All openings shall be fully prepared to receive windows. Any shoring or debris must be removed and any corrective work completely finished prior to the start of window installation.
- I. Windows shall be installed level, square and plumb without bind. The vents shall be aligned and adjusted for optimum weathering contact to the frame and ease of operation. After installation the primary and secondary locks shall be checked and adjusted for proper function.
- J. Nail fin windows shall be securely attached to the framing with #6d or larger galvanized nails or other corrosion resistant fasteners.
- K. Headers:
1. Must not be nailed.

L. Fastening:

1. Nail through fin into framing along sides and base.
2. At the head, nails may be placed 1/2" above fin and bent down over fin to allow for header deflection, but shall not interfere with siding, sheathing, trim, etc.
3. Install fastener screws such that operable panel cannot be lifted from window assembly.

M. Adjust operating sash and hardware to provide tight fit at contact points and weatherstripping.

N. Lubricate hardware and moving parts.

O. Install flashing and building paper and building wrap at window opening in shiplap fashion.

P. Install window opening multiple flashing assembly in accordance with manufacturer's recommendations with components as herein specified.

3.4 PROTECTION AND CLEAN UP

A. Refer to Division 1 for protection and cleaning requirements.

B. Cover windows during spray painting or other construction operations that might cause damage.

C. Protection of all installed window shall be the responsibility of the **General Contractor**.

D. Labels:

1. Leave all labels in place, intact and legible, until reviewed and approved by the Architect.
2. Do not at any time remove required AAMA labels.

E. Promptly after, thoroughly clean all exposed surfaces and glazing interior and exterior.

1. Use only the cleaning materials and techniques recommended by the manufacturer of the material being cleaned.
2. Do not scratch or otherwise damage the glass, screen, or aluminum finish.

F. Institute protective measures and other precautions required to assure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

G. Repair all minor damage to finishes as approved by Architect, replace all other.

H. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures

I. Provide record drawings in accordance with Division 1 closeout submittal procedures.

END OF SECTION 08 51 13

SECTION 08 71 00 – DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following, but is not necessarily limited to:
 - 1. Door Hardware, including electric hardware.
 - 2. Thresholds, gasketing and weather-stripping.

1.03 REFERENCES (USE DATE OF STANDARD IN EFFECT AS OF BID DATE.)

- A. 2022 California Building Code, CCR, Title 24.
- B. BHMA – Builders' Hardware Manufacturers Association
- C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
- D. DHI – Door and Hardware Institute
- E. NFPA - National Fire Protection Association.
 - 1. NFPA 80 - Fire Doors and Other Opening Protectives
 - 2. NFPA 105 - Smoke and Draft Control Door Assemblies
- F. UL - Underwriters Laboratories.
 - 1. UL 10C - Fire Tests of Door Assemblies
 - 2. UL 305 - Panic Hardware
- G. WHI - Warnock Hersey Incorporated
- H. SDI - Steel Door Institute

1.04 SUBMITTALS & SUBSTITUTIONS

- A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.
- B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Submit six (6) copies of schedule organized vertically into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
 - 1. Include a Cover Sheet with;
 - a. Job Name, location, telephone number.
 - b. Architects name, location and telephone number.
 - c. Contractors name, location, telephone number and job number.
 - d. Suppliers name, location, telephone number and job number.
 - e. Hardware consultant's name, location and telephone number.
 - 2. Job Index information included;

- a. Numerical door number index including; door number, hardware heading number and page number.
 - b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
 - c. Manufacturers' names and abbreviations for all materials.
 - d. Explanation of abbreviations, symbols, and codes used in the schedule.
 - e. Mounting locations for hardware.
 - f. Clarification statements or questions.
 - g. Catalog cuts and manufacturer's technical data and instructions.
3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101	(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

- D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.
- E. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
- F. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- G. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.
- H. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.
- I. LEED Certification Points: Submit information and certifications necessary to achieve maximum points for LEED certification; coordinate and cooperate with Owner and Architect in providing information necessary for required LEED rating.

1.05 QUALITY ASSURANCE

- A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to

Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Responsible for detailing, scheduling and ordering of finish hardware.
 2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing.
 3. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.
- C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".
- E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- F. Product packaging to be labelled in compliance with CA Prop 65, Safe Drinking Water and Toxic Enforcement Act of 1986.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.
- B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.
- C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.
- D. Contractor to inventory door hardware jointly with representatives of hardware supplier and hardware installer until each all are satisfied that count is correct.

1.07 WARRANTY

- A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
 1. Locksets: Ten (10) years.
 2. Closers: Thirty (30) years.
 3. Exit devices: Three (3) years.
 4. All other hardware: Two (2) years.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.09 PRE-INSTALLATION CONFERENCE

- A. Convene a pre-installation conference at least one week prior to beginning work of this section.
- B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.
- C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

<u>Item</u>	<u>Manufacturer</u>	<u>Acceptable Substitutes</u>
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Exit Devices	Von Duprin	Or Approved Equal
Closers	LCN	Or Approved Equal
Protection Plates	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	Zero	Pemko, National Guard
Seals & Bottoms	Zero	Pemko, National Guard

2.02 MATERIALS

- A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
 1. Hinges shall be sized in accordance with the following:
 - a. Height:
 1. Doors up to 42" wide: 4-1/2" inches.
 2. Doors 43" to 48" wide: 5 inches.
 - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
 2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
- B. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.
- C. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Rhodes" design, fastened with through-bolts and threaded chassis hubs.
 1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
 - a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
 - b. Offset lever pull – minimum 1,600 foot pounds without gaining access
 - c. Vertical lever impact – minimum 100 impacts without gaining access
 2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
 3. UL 10C for 4'-0" x 10'-0" 3-hour fire door.
 4. Cylinders: Refer to "KEYING" article, herein.

5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4' x 10' opening. Provide proper latch throw for UL listing at pairs.
8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
11. Provide wired electrified options as scheduled in the hardware sets.
 - a. 12 through 24 volt DC operating capability, auto-detecting
 - b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
 - c. 0.230A (230mA) maximum current draw
 - d. 0.010A (10mA) holding current
 - e. Modular / "plug in" request to exit switch
12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
- D. Deadlocks: Rotating cylinder trim rings of attack-resistant design. Mounting plates and actuator shields of plated cold-rolled steel. Mounting screws of 1/4" diameter steel and protected by drill-resistant ball bearings. Steel alloy deadbolt with hardened steel roller. Strike alloy deadbolt with reinforcer and two 3" long screws. ANSI A156.5, 2001 Grade 1 certified.
- E. Exit devices: Von Duprin as scheduled.
 1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
 2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
 3. Mechanism case shall have an average thickness of .140".
 4. Compression spring engineering.
 5. Non-handed basic device design with center case interchangeable with all functions.
 6. All devices shall have quiet return fluid dampeners.
 7. All latchbolts shall be deadlocking with 3/4" throw and have a self-lubricating coating to reduce friction and wear.
 8. Device shall bear UL label for fire and or panic as may be required.
 9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
 10. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
 11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
 12. Furnish glass bead kits for vision lites where required.
 13. All Exit Devices to be sex-bolted to the doors.
 14. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
 - a. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware.
- F. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.
 1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.

2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 1 1/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
 3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
 4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
 5. Closers shall be installed to permit doors to swing 180 degrees.
 6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
 7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
 8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.
- G. Door Stops:
1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
 2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
 3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.
- H. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.
- I. Thresholds: As Scheduled and per details.
1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
 2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection".
 3. Use 1/4" fasteners, red-head flat-head sleeve anchors (SS/FHSL).
 4. Thresholds shall comply with CBC Section 11B-404.2.5.
- J. Seals: Provide silicone gasket at all rated and exterior doors.
1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.

2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on "S" labeled Positive Pressure door assemblies.
- K. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.
- L. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

2.03 KEYING

- A. Furnish a Proprietary Schlage masterkey system as directed by the owner or architect. Key system to be designated and combined by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer.
- B. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.
- C. Establish a new masterkey system for this project as directed by the keying schedule.
- D. Furnish all cylinders in the Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI)
- E. Furnish construction keying for doors requiring locking during construction.
- F. Furnish all keys with visual key control.
 1. Stamp key "Do Not Duplicate".
 2. Stamp (BHMA) key symbol on key.
- G. Furnish all cylinders with visual key control.
 1. Stamp (BHMA) key symbol on side of cylinder (CKC).
- H. Furnish mechanical keys as follows:
 1. Furnish 2 cut change keys for each different change key code.
 2. Furnish 1 uncut key blank for each change key code.
 3. Furnish 6 cut masterkeys for each different masterkey set.
 4. Furnish 3 uncut key blanks for each masterkey set.
 5. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
 6. Furnish 1 cut control key cut to each SKD combination.
- I. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.
 1. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
- J. Furnish one Schlage cabinet lock for each cabinet door or drawer so designated on the drawings or keying schedule to match the masterkey system.
 1. Furnish CL77R for use with FSIC Schlage cylinders.

2.04 FINISHES

- A. Generally to be satin chrome US26D (626 on bronze and 652 on steel) unless otherwise noted.
- B. Furnish push plates, pull plates and kick or armor plates in satin stainless steel US32D (630) unless otherwise noted.
- C. Door closers shall be powder-coated to match other hardware, unless otherwise noted.

- D. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.05 FASTENERS

- A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
- B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
- C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
- D. Provide expansion anchors for attaching hardware items to concrete or masonry.
- E. All exposed fasteners shall have a phillips head.
- F. Finish of exposed screws to match surface finish of hardware or other adjacent work.
- G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.
- C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2018 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.
- G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

3.03 ADJUST AND CLEAN

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surface soiled by hardware installation.

- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.
- E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.04 HARDWARE LOCATIONS

- A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.05 FIELD QUALITY CONTROL

- A. Contractor is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.06 SCHEDULE

- A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.
- B. While the hardware schedule is intended to cover all doors, and other movable parts of the building, and establish type and standard of quality, the contractor is responsible for examining the Plans and Specifications and furnishing proper hardware for all openings whether listed or not. If there are any omissions in hardware groups in regard to regular doors they shall be called to the attention of the Architect prior to bid opening for instruction; otherwise, list will be considered Complete. No extras will be allowed for omissions.
- C. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

GLY	=	Glynn-Johnson Corporation	Overhead Door Stops
IVE	=	Ives	Hinges, Protection Plates & Door Stops
LCN	=	LCN	Door Closers
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
VON	=	Von Duprin	Exit Devices
ZER	=	Zero International	Thresholds, Gasketing & Weather-stripping

HARDWARE GROUP NO. 01

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-99-L-KC-06	626	VON
1	EA	RIM CYLINDER	20-057 ICX	626	SCH
1	EA	MORTISE CYLINDER	26-091 ICX XQ11-948	626	SCH
2	EA	PRIMUS CORE	20-740-XP EV29 S	622	
1	EA	OH STOP	100S	630	GLY
			(ONLY @ LOCATIONS WHERE FS18S CAN'T BE USED)		
1	EA	SURFACE CLOSER	4040XP EDA TB	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	DOOR SWEEP	328AA	AA	ZER
1	SET	HEAD & JAMB SEALS	328AA-S	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 02

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	VANDL OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 S	622	SCH
1	EA	FLOOR STOP	FS436/FS438 AS REQ.	626	IVE
1	SET	HEAD & JAMB SEALS	328AA-S	AA	ZER
1	EA	DOOR BOTTOM	364AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 03

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	VANDL CLASSROOM LOCK	ND94TD RHO	626	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 S	622	SCH
1	EA	OH STOP	100S	630	GLY
1	SET	HEAD & JAMB SEALS	328AA-S	AA	ZER
1	EA	DOOR BOTTOM	364AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 04

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/INDICATOR	LV9056T 06A L583-363 OS-OCC	643e	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 S	622	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS401/402CCV	626	IVE
1	SET	HEAD & JAMB SEALS	328AA-S	AA	ZER
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR BOTTOM	364AA	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 05

1	EA	CONTINUOUS HINGE	224XY	630	IVE
1	EA	VANDL CLASSROOM LOCK	ND94TD RHO	626	SCH
1	EA	PRIMUS CORE	20-740-XP EV29 S	626	SCH
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 2" LDW B-CS	630	IVE
1	EA	HOLD WALL STOP	WS45	626	IVE
1	SET	HEAD & JAMB SEALS	328AA-S	AA	ZER
1	EA	THRESHOLD	PER DETAIL		

HARDWARE GROUP NO. 06

10	EA	HINGE	3PB1	626	IVE
1	EA	FLUSH PULL	221	626	IVE

END OF SECTION 08 71 00

SECTION 08 80 00 – GLASS AND GLAZING

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Glass and glazing.
 - a. Vision
 - 2. Glazing Accessories

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Architectural Manufacturers Association (AAMA), www.aamanet.org
 - 1. AAMA – “Metal Curtain Wall, Window Storefront and Entrance Guide Specifications Manual”
- E. American National Standards Institute (ANSI), www.ansi.org
- F. American Society For Testing and Materials (ASTM), www.astm.org
 - 1. ASTM C1036 Flat Glass
 - 2. ASTM C1048 Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass
 - 3. ASTM E119 Fire Tests of Building Construction and Materials
 - a. Fire barriers over 25% of wall area
 - 4. ASTM E283 Rate of Airflow Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
 - 5. ASTM E330 Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference

- 6. ASTM E331 Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
- 7. ASTM E774 Sealed Insulating Glass Units
- 8. ASTM E2010 Positive Pressure Fire Tests of Window Assemblies.
- 9. ASTM E2074 Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies

G. Glass Association of North America (GANA), www.glasswebsite.com

H. Flat Glass Marketing Association, "Glazing Manual", most current adopted edition.

I. National Fenestration Rating Council, NFRC, www.nfrc.com

J. National Glass Association (NGA), www.glass.org

K. Window and Door Manufacturers Association, (WDMA), www.wdma.org

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

- 1. Comply with manufacturer's standards.
- 2. Comply with Building Code.
- 3. Job site inspections shall be done as herein specified and as listed in drawings.
- 4. Testing shall be done as herein specified and as listed in drawings.
- 5. Refer to Division 1 for additional requirements for DSA projects

B. Standards:

Item	Name of Test	Performance	Testing Std.
Safety Glazing	Human Impact Loads	Comply	CBC 2406
	Identification		CBC Section 2406.3
	Hazardous Locations		CBC Section 2406.4
Glazing	General	Comply	CBC Section 2401
	Definitions		CBC Section 2402
	General Requirements		CBC Section 2403
	Wind, Snow, Seismic and Dead Loads on glass		CBC Section 2404
Refer to drawings and as herein specified			

C. Sustainability:

- 1. Refer to Division 1 sustainability requirements.
- 2. Refer to product criteria identified herein.

D. Construction Testing:

Item	Name of Test	Performance Results	Testing Std.
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Framed glazing system	Hose stream test	Comply	Refer to specific window section
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E. Construction Monitoring/Observations by others:

Item	Name of Test	Performance Results	By Whom
Window system installation	Periodic observation by window mfgr.	Comply	Refer specific window system section

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.
 - 1. Schedule of all glass types with all listed performance criteria
 - a. Technical data substantiating compliance with these specifications.
 - 2. Submit technical data for all sealants and other materials use in completing the work in this section.
- E. Submit samples:
 - 1. Five (5) 6" square samples for each required glass and construction type.
- F. Site mock-up, refer to "Mock-Up" heading.
- G. Certification:
 - 1. Safety rating of glass
 - 2. Fire ratings of glass
 - 3. Technical values of glass

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- D. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid
- E. Stipulations:

1. Glazing in fired rated assemblies shall be labeled for the required fire protection rating and installed in accordance with their listing.
 2. Glazing at tempered required locations and designated locations shall bear appropriate designation on glass
 - F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 1. Agenda for meeting shall include, but not be limited to;
 - a. Frames to receive glazing
 - b. Glazing types
 2. **General Contractor** shall request meeting 5 days in advance of construction.
 - G. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation work to review installation procedures.
 1. Manufacturer's representative shall review and certify in writing all phases of construction to verify the complete work meets specification requirements.
 2. Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.
 - H. Miscellaneous criteria:
 1. Protect glass from edge damage at all times during handling, and installation.
 2. Comply with combined recommendations of glass manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are shown or specified.
 3. Comply with "Reference Standards" specified above except as shown and specifically recommended otherwise by the manufacturers of the glass and glazing materials.
 4. Inspect each piece of glass immediately before installation, and eliminate any, which have observable edge damage or face imperfections.
- 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING
- A. Refer to Division 1 for product delivery, storage and handling requirements.
 - B. Deliver glass crated to the jobsite to protect it against scratches, discoloration, breakage, or other damage. Deliver glazing compounds to jobsite in manufacturers factory sealed containers, bearing the brand name. Store materials under cover until their installation.
- 1.7 JOB CONDITIONS
- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
 - B. Do not proceed with installation of liquid sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional **[Five] (5)** year warranty agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Door lites
 - 2. Window Frames
 - 3. Roof structure
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 08 11 13 – Steel Doors and Frames
 - 3. Section 08 14 00 – Wood Doors

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.

1.13 TESTING AGENT

- A. Refer to Division 1 for Testing Laboratory service requirements

- B. Refer to specific window frame system specifications.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturer shall be one of the following and as listed herein and in Drawings:
 - 1. Glazing:
 - a. PPG, www.ppg.com,
 - b. Cardinal Glass Corporation, www.cardinalcorp.com
 - c. Viracon, www.viracon.com
 - d. As herein specified
 - 2. Window Films;
 - a. 3M, 800.480-1704, www.glassscapes.com/3m
 - 3. Fire glazing and louver tapes
 - a. Pemko, www.pemko.com
 - 4. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS – GLAZING: INTERIOR VISION GLASS TYPES

A. **Monolithic:**

- 1. Application:
 - a. **Framed Door Vision Lites (Windows)**
 - 1) Schedule:
 - a) Mfgr: PPG www.ppg.com , [PPG Glass Configurator](#)
 - b) Type: Type 3, Single Vision, Fully Tempered, Float glass

- c) Product: Choose among Mfg. catalog
- d) Color: Clear
- e) Assembly: Laminated glazing
- f) Thickness: 1/4" min.
- g) Performance Data Requirements:
 - i. Rating: None
 - ii. Shading Coefficient: Not applicable
 - iii. U-value: Not applicable
- h) Coordinate: Refer to Section 8 Wood Doors

2) Fully tempered safety glass at all locations.

2.3 MATERIALS – GLAZING: EXTERIOR VISION GLASS TYPES

A. **Insulated**

1. Application:

a. **Storefront Windows**

- 1) Type: Insulated units
- 2) Schedule:
 - a) Thickness:
 - i. Insulated: 1" overall with 1/2" airspace
 - b) IG spacer
 - i. Spacer® from Edgetech unless unit is not available with this spacer
- 3) Specifications: Refer also to Performance heading 1.03.
 - a) Insulated Glazing: (Values for glass unit, not overall window)
 - i. Product:
 - a. Mfgr: Vitro Architectural Glass
 - b. Product: Sungate 400 Low-E Glass (2) Clear + Clear
 - c. Color: Clear
 - d. Coating: Low E
 - e. Type:
 - i). Tempered at doors
 - ii). Fully tempered safety glass at all locations indicated and as required by CBC.
 - iii). Tempered at all windows and doors.

f. Fill: Insulated with Argon Fill

g. Performance:

Product (One lite)	U Factor- winter	Solar Blockage	Visible Light			Solar Heat Gain Coeff.	Light to Solar Gain	Fading Transmission		
			Trans	Refl. Ext	Refl Int			UV	TDW-K	TDW
Insulating Glass										
400 (2) Clear + Clear	Nighttime 0.32/ Argon 0.28	76%	76%	14%	14%	0.60	1.27	-	-	-
A. Refer to drawings and as herein specified.										

b. Framed Door Vision Lites (Windows)

1) Type: Insulated units

2) Schedule:

a) Thickness:

i. Insulated: 1" overall with ½" airspace

b) IG spacer

i. Spacer® from Edgetech unless unit is not available with this spacer

3) Specifications: Refer also to Performance heading 1.03.

a) Insulated Glazing: (Values for glass unit, not overall window)

i. Product:

a. Mfgr: Cardinal

b. Product: LoE³ 366

c. Color: Clear

d. Coating: Low E

e. Type:

i). Tempered at doors

ii). Fully tempered safety glass at all locations indicated and as required by CBC.

iii). Tempered at all windows and doors

f. Fill: Insulated with Argon Fill

g. Performance:

Product (One lite)	U Factor- winter	Solar Blockage	Visible Light			Solar Heat Gain Coeff.	Shading Coeff.	Fading Transmission		
			Trans	Refl. Ext	Refl Int			UV	TDW-K	TDW
Insulating Glass										
LoE ³ - 366 #2	0.24 Argon filled	73%	66%	11%	12%	0.27	0.31	0.05	N/A	0.43
B. Refer to drawings and as herein specified.										

2.4 MATERIALS – GLAZING: EXTERIOR SPANDREL TYPES – Not Used

2.5 MATERIALS – SPECIALTY GLAZING: INTERIOR – Not Used

2.6 MATERIALS – MIRRORS – Not Used

2.7 MATERIALS - ACCESSORIES

A. Sealant: Refer to Section 07 92 00 - Sealants & Caulking.

B. Compounds:

1. Provide hardness of materials recommended by the manufacturer for the required application and condition of installation in each case.
2. Provide only compounds which are known (proven) to be fully compatible with contact surfaces.
 - a. Extra care shall be used in the selection and use of structural rated sealant.

C. Setting blocks: Neoprene, 70-90 durometer hardness, with proven compatibility with sealants used.

D. Spacers: Neoprene 40-50 durometer hardness, with proven compatibility with sealants used.

E. Compressible filler rod: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 5-10 psi compressive strength for 25% deflection. Confirm compatibility with sealants, refer to Section 07 92 00.

F. Cleaners, primers, and sealers: Type recommended by sealant and gasket manufacturer.

G. Glazing gaskets:

1. Use for interior glazing only.
2. Extruded, flexible DuPont Neoprene gaskets of the profile shown.
3. Confirm compatibility with sealant manufacturer.

2.8 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect Owner**.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.
- B. Surface:
 - 1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 MOCK-UP

- A. Erect at location approved by **Architect**.
 - 1. Mock-up shall be part of final construction once approved by **Architect**.
 - 2. Mock-up shall comprise of all components and finishes as specified and indicated in Drawings.
 - 3. Mockup shall be done under each specific window frame specification.

3.5 INSTALLATION

- A. General:
 - 1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- B. Preparation for Glazing
 - 1. Clean the glazing channel, or other framing members to receive glass, immediately before glazing. Remove coatings, which are not firmly bonded to the substrate.
 - 2. Apply primer or sealer to joint surfaces wherever recommended by sealant manufacturer.
- C. Glazing

1. Install setting blocks or setting bed of proper size quarter points of sill rabbet. Set blocks or bed material in thin course of the heel-bead compound, if used.
2. Provide spacers inside and out, and of proper size and spacing, for all glass sizes larger than 50 united inches, except where gaskets and pre-shimmed tape are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape. Glass to be 3/16" clear of frame, frame lap to be 5/16" minimum.
3. Voids and filler rods: Prevent exudation of sealant or compound by forming voids or installing filler rods in the channel at the heel of jambs and head (do not leave voids in the sill channels) depending on light size, thickness and type of glass, and complying with manufacturer's recommendations.
4. Do not attempt to cut, seam, or abrade glass, which is tempered, heat strengthened, or coated. Do not nip glass.
5. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
6. Glazing of interior window frames:
 - a. Use pressure or foamed tape and sealant as noted to eliminate rattle and reduce sound transmission.
 - b. Coordinate with window frame manufacturer.
7. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from the glass. Install pressurized tapes and gaskets to protrude slightly out of the channel, so as to eliminate innate dirt and moisture pockets.
8. Clean and trim excess glazing materials from the glass and stops or frames promptly after installation, and eliminate stains and discolorations.
9. Where wedge-shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure that gaskets will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel head.

D. Cure

1. Cure glazing sealants and compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.

3.6 FIELD QUALITY CONTROL

A. Product manufacturer shall provide field service support as requested by the Installer/Applicator

1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
2. The Applicator shall be responsible for the proper application of the materials.

- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.7 TESTING

- A. Testing shall be done under each specific window frame specification.

3.8 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Remove and replace glass which is broken, chipped, cracked, and abraded or damaged in other ways during the construction period, including natural causes, accidents and vandalism.
- C. Maintain glass in a reasonably clean condition during construction, so that it will not be damaged by corrosive action and will not contribute (by wash-off) to the deterioration of glazing materials and other work.
- D. Wash and polish glass on both faces not more than 4 days prior to **Owner's** Beneficial Occupancy Date.
- E. Keep areas of work and building free from accumulated debris, rubbish and waste materials as work progresses.
- F. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
 - 2. Remove masking tape immediately after tooling joints, leaving finished work in neat and clean condition.
 - 3. Clean up and leave premise broom clean. Clean adjoining work spotted or otherwise defaced by work of this Section.
- G. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- H. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- I. After completion of work in this section, remove all erection equipment and implements of service, and debris.
- J. Leave entire area in a neat, clean, acceptable condition.
- K. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- L. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- M. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 08 80 00

SECTION 09 24 00 – PORTLAND CEMENT PLASTER ASSEMBLY

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the lath and plaster work, including, but not limited to:
 1. Typical exposed Cement Plaster System(s):
 - a. **Cement Plaster Assembly:**
 - 1) Non-Insulated:
 - a) Provide and install an "Exterior Three Coat System" consisting of one (1) integrally colored acrylic Finish Coat over 1 (one) brown coat over one (1) scratch coat, over wire lath and over water resistant barrier cold applied, self-adhering membrane & flexible flashing over sheathing as herein indicated and as indicated in drawings.
 - b. **Finish System:** As herein indicated and in conformance with Section 09 90 00 Painting and Coatings for Elastomeric Paint over Exterior three Coat System.
 - c. **Accessories:** As herein indicated
 2. Provide such other incidentals, trims and accessories materials as necessary to complete the work, whether listed in this Section or not, including, but not limited to:
 - a. Cold Applied Self-adhering Waterproof Membrane Underlayment (CASAM) – self-adhering over primed substrate, refer to Section 07 13 26 Cold Applied Self Adhering Membrane (CASAM)and Flexible Flashing
 - b. Cold Applied Self-adhering Waterproof Membrane (CASAM) flashing at door and window openings – self-adhering, refer to Section 07 13 26 Cold Applied Self Adhering Membrane (CASAM)and Flexible Flashing
 - c. Reveals, expansion screeds/reveals, etc.
 - d. Wall penetration prefabricated plastic boot/ collar flashing at pipes and wall boxes.
 - e. Wall sheet metal flashing as detailed and/or herein indicated.
 - f. Paint for exposed portions of reveals, screed, expansion joints, etc., refer to Section 09 90 00.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Concrete Institute (ACI) www.aci-int.org
 - 1. ACI 524R Guide to Portland Cement Plastering
- E. American National Standards Institute (ANSI) www.ansi.org
 - 1. A42.4-1995 Metal Lath, Wire Lath, Wire Fabric Lath and Metal Accessories
 - 2. ANSI 99-A-2001
 - 3. A118.6-1999, H-4.4 <5% Water Absorption of Thick Bed Mortar
 - 4. A118.4-1999, F-61 5000psi Compressive Strength of Thick Bed Mortar
- F. American Society For Testing and Materials (ASTM) www.astm.org
 - 1. ASTM A526 Steel Sheet, Hot-Dip Galvanized, Commercial Quality
 - 2. ASTM B117 Salt Spray Resistance
 - 3. ASTM C22 Gypsum
 - 4. ASTM C36 Gypsum Wallboard
 - 5. ASTM C37 Gypsum Lath
 - 6. ASTM C61 Keene's Cement
 - 7. ASTM C62 Building Brick
 - 8. ASTM C79 Gypsum Sheathing Board
 - 9. ASTM C91 Masonry Cement
 - 10. ASTM C109 Hydraulic Cement Mortars
 - 11. ASTM C116 Fiber Reinforced Concrete and Shotcrete
 - 12. ASTM C144 Aggregate
 - 13. ASTM C150 Portland Cement – Type I, II & III
 - 14. ASTM C151 Autoclave Expansion of Portland Cement
 - 15. ASTM C157 Length Change of Hardened Hydraulic-Cement Mortar and Concrete
 - 16. ASTM C185 Air Content of Hydraulic Cement Mortar
 - 17. ASTM C260 Air-Entraining Admixtures
 - 18. ASTM C297 Tensile Bond

- | | |
|----------------|---|
| 19. ASTM C557 | Adhesives for Fastening Gypsum Wallboard to Wood Framing |
| 20. ASTM C442 | Gypsum Backing board |
| 21. ASTM C472 | Testing of Gypsum, Gypsum Plasters & Gypsum Concrete |
| 22. ASTM C473 | Testing of Gypsum Panel Products |
| 23. ASTM C475 | Gypsum Wallboard Tape and Joint Compound |
| 24. ASTM C474 | Test Methods for Joint Treatment Materials |
| 25. ASTM C494 | Chemical Admixtures for Concrete, Type A, C & E |
| 26. ASTM C496 | Splitting Tensile Strength of Cylindrical Concrete Specimens |
| 27. ASTM C514 | Nails for Application of Gypsum Board |
| 28. ASTM C578 | Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation |
| 29. ASTM C630 | Water-Resistant Gypsum Backing Board |
| 30. ASTM C841 | Installation of Interior Lathing and Furring |
| 31. ASTM C847 | Metal Lath |
| 32. ASTM C897 | Aggregate for Job-Mixed Portland Cement Plaster |
| 33. ASTM C926 | Application of Portland Cement-Based Plaster |
| 34. ASTM C931 | Exterior Gypsum Soffit Board |
| 35. ASTM C932 | Surface-Applied Bonding Agents for Exterior Plastering |
| 36. ASTM C1002 | Steel Self-Piercing Tapping Screws for the application of Gypsum Panel |
| 37. ASTM C1032 | Woven Wire Plaster Base |
| 38. ASTM C1063 | Installation of Lathing and Furring for Portland Cement Plaster |
| 39. ASTM C1072 | Measurement of Masonry Flexural Bond Strength |
| 40. ASTM C1116 | Firer Reinforcing |
| 41. ASTM D522 | Flexibility, Method B |
| 42. ASTM D968 | Abrasion Resistance, Method A Falling Sand |
| 43. ASTM D2244 | Instrumentally Measured Color Difference |
| 44. ASTM D2247 | Water Resistance |
| 45. ASTM D2486 | Scrub Resistance |
| 46. ASTM D3273 | Mildew Resistance |
| 47. ASTM D4214 | Chalk Rating |
| 48. ASTM D4060 | Abrasion Resistance |
| 49. ASTM D4541 | Adhesion to Concrete (pull off strength) |

- 50. ASTM E84 Surface Burning Characteristics
 - 51. ASTM E96 Water Vapor Transmission
 - 52. ASTM E149 Adhesion
 - 53. ASTM E2134 Tensile Bond
 - 54. ASTM E2485 Freeze-Thaw Resistance
 - 55. ASTM G154 Accelerated Weathering
 - 56. ASTM G155 Accelerated Weathering
 - G. Dryvit www.dryvit.com
 - 1. Manufacturer's reference material (refer to Part 2)
 - H. Federal Specifications (FS) www.fss.gsa.gov/pub/fedspecs/search.cfm
 - 1. FS FF-N-105B Nails, Wire Staples for Application of Gypsum Board
 - 2. FS UU-B-790a Water resistant barriers
 - 3. FS QQ-W-461H Wire, Steel and Carbon (round, bare & coated)
 - I. International Code Council (ICC) www.iccsafe.org
 - 1. ICC NER 3213
 - J. Metal Lath/Steel Framing Association (ML/SFA)
 - 1. ML/SFA 920 Guide Specifications for Metal Lathing and Furring
 - K. Northwest Wall and Ceiling Bureau (NWCBC) www.nwcb.org
 - 1. Portland Cement Plaster Stucco Reference Guide (Unless specified herein to have more restrictive requirements.)
 - L. Scientific Certification Systems (SCS), www.scs-certified.com
 - M. Technical Services Information Bureau (TSIB), www.tsib.org
 - N. Underwriters Laboratories (UL), www.ul.com
 - 1. UL U-434 One Hour Assemblies
 - O. Western Conference of Wall and Ceiling Institute (WCWCI)
 - 1. The Energy Code and Plaster Assemblies Technical Bulletin
- 1.3 PERFORMANCE, TESTING AND INSPECTION
- A. **General:**
- 1. Comply with manufacturer's standards.
 - 2. Comply with Building Code.
 - 3. Job site inspections shall be done as herein specified and as listed in drawings.
 - 4. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Acrylic Elastomeric Finish	Material	Manufacturer	Dryvit, Weatherlastic
	Surface Burning Characteristics	Flame Spread <25 Smoke Developed <450	ASTM E84
	Flexibility	1.0" diameter @ 40°F	ASTM D522 Method B
	Water Vapor Transmission	17.4 Perms	ASTM E96 Procedure B
	Accelerated Weathering	2000 hours: no deleterious effects	ASTM G154 Cycle 1 & ASTM G155
	Chalk Rating	9+ after 5000 hours	ASTM D4214 after ASTM G154 Cycle 1
	Color Difference	Color Change: 1.3 Delta E after 5000 hours QUV	ASTM D2244
	Freeze-Thaw Resistance	90 cycles: No deleterious effects	ASTM E2485
	Mildew Resistance	28 days, no growth	ASTM D3273
	Salt Spray Resistance	1000 hours: No deleterious effects	ASTM B117
	Water Resistance	42 days: No deleterious effects	ASTM D2247
	Abrasion Resistance	1000 liters: No deleterious effects	ASTM D968 Method A
		1000 cycles: .50 gm mass los/rev	ASTM D4060
	Adhesion to Concrete	> 156 psi	ASTM D4541
	Tensile Bond	>24 psi	ASTM C297
	Physical Properties	Tensile strength 200 psi Elongation – 450% recovery at 100% Elongation – 90% minimum	ASTM D412
Cement Plaster	Vertical & Horizontal Assembly	Comply	CBC Section 2504
	Shearwall Construction		CBC Section 2505
	Lighting & Plastering		CBC Section 2507
	Lathing & Furring		CBC Section 2510
	Exterior Plaster		CBC Section 2512
Fasteners	Type, size, finish and penetration	Comply and as herein specified	ASTM C 1063, ESR-1539
Lathing and Plastering	Assembly	Comply and as herein specified	CBC Section 2507
Insulation		Comply with section 7 Building Insulation	

Lath	Attachment	Wall Framing @ 24" O.C. - Secure lath @ 4" O.C. along framing members Wall framing @ 16" O.C. - Secure lath @ 6" O.C. along framing members	WCWCI & TSIB
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. Construction Testing:

Item	Name of Test	Performance Results	Testing Std.
CASAM	Adhesion to substrate	Shall not pull off without damaging and/or stretching the membrane	N/A Refer to Section 07 13 26

1.4 SUBMITTALS AND MOCK-UPS

- Refer to Division 1 for substitution, deviation and/or submittal procedures.
- Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- Refer to Division 1 for sustainability requirements
- Submit Manufacturer's data and shop drawings.
 - Product literature, samples and mock-ups of system.
 - Certification of compliance of materials and product literature.
 - Product literature for all additives and proprietary components.
 - Manufacturer's recommended installation procedures for accessories which, when approved by the **Architect**, will become the basis for accepting or rejecting actual installation procedures used for those accessories on the work.
- Submit samples.
 - Finish sample for texture and color for **Architect** approval prior to field mock-up.
 - 12" x 12" samples of the specified finishes for each finish/texture, and color, used on the project.
 - Each sample shall be prepared using the same tools and techniques proposed for the actual installation by the applicator/contractor.
- Site Mock-up: Refer to "Mock Up" heading.

1. Prior to installation, fabricate mock-up panels using required materials for each type and location.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer shall have been in business for **five (5)** years providing/finishing similar size projects and complexity.
 1. Application of the cement plaster assembly and finish will be according to manufacturer's recommendations and shall be applied by an applicator experienced in the application of plaster like materials and with equipment approved by finish manufacturer.
 2. The work shall be performed by a skilled and trained work crew.
 3. Work shall be performed to create a rigid, secure, level and plumb finish surface, with line dimensions and contours as indicated in reference standards and project documents.
 4. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
 - a. Specialize in this scope of work.
 - b. Have qualified and properly trained people to perform work.
 - c. Be licensed, bonded and insured.
 - d. Be in good financial standing and capable of meeting the financial obligations associated with the cement plaster scope of work on the project.
 - e. Have documented experience in quality work of comparable scope.
 - f. Be recommended as a qualified installer by NWCB or approved by **Architect** prior to bid.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
 1. Shall have marketed acrylic and acrylic elastomeric plaster systems in the United States for at least **five (5)** years.
 2. Shall be a member in good standing of **EIMA (EIFS Industry Members Association)**.
 3. Shall provide field service personnel at the local level to service this project.
- D. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid
- E. Stipulations:
 1. Install specified products and systems in accordance with reference standards, manufacturer's recommendations and as herein specified.
 2. Surface blemishes, cracking, etc. shall be rejected.
 3. Substrates and joints:

- a. Application of Finish products shall be applied only to the substrate when prepared in accordance with this specification.
 - b. The applicator shall verify that the substrate is acceptable prior to application of Finish products.
 - c. Do not install the Finish material and/or paint over sealant joints.
 - 4. Sealant joints:
 - a. Application of sealant shall be installed in joints on cleaned and primed concrete prior to Finish coat and/or paint being installed.
 - 5. Wall Framing
 - a. Thermal insulation wall assembly
 - 1) See drawings for stud framing, minimum
 - F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 - 1. Agenda for meeting shall include, but not be limited to;
 - a. Framing
 - b. Substrate
 - c. Penetrations
 - d. Mock-ups
 - 2. **General Contractor** shall request meeting 5 days in advance of construction.
- 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING
- A. Refer to Division 1 for product delivery, storage and handling requirements.
 - B. Materials at job site to be in original containers with labels intact and legible.
 - C. All trim accessories and lath and/or other specified products to be shipped to job site in original containers. Any damaged or bent materials shall be replaced.
 - D. Deliver and store products suitable wrapped or packaged to protect against damage. Do not remove protective coverings until time of installation.
 - 1. Protect finish and edges in accordance with panel manufacturer's recommendations.
 - 2. Store material in accordance with panel manufacturer's recommendations.
 - 3. Materials shall be stored in a cool, dry location, out of direct sunlight and protected from weather and other damage.
 - 4. Materials at job site to be in original containers with labels intact and legible.
 - 5. Upon arrival, materials shall be inspected for physical damage, freezing or overheating. Questionable materials shall not be used.

- E. All sack materials to be stored above ground, dry and protected.
 - 1. Material shall provide suitable site for delivery, storage and handling of materials.
 - 2. Material shall provide suitable site for plastering operation.
- F. All sack materials to be stored above ground, dry and protected.
 - 1. Material shall provide suitable site for delivery, storage and handling of materials.
 - 2. Material shall provide suitable site for plastering operation.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.
- B. Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after application of plaster.
- C. Material shall not be applied or stored under ambient conditions contrary to manufacturer's printed recommendations.
- D. Existing conditions: The applicator shall have access to electric power, clean water and a clean work area at the location where the materials are to be installed.
- E. Environmental Conditions:
 - 1. The ambient air and wall temperatures shall be within the limits of the specific material.
 - 2. The temperature shall remain so for at least 24 hours thereafter, or longer if necessary for the materials to be sufficiently dried.
- F. Sequencing and Scheduling:
 - 1. Application of the Finish and cement plaster materials shall be coordinated with other construction trades.
 - 2. Sufficient labor and equipment shall be employed to ensure a continuous operation, free of cold joints, texture variations, scaffold lines, etc.
- G. Cold Weather Conditions:
 - 1. Do not apply cement plaster when ambient temperature is less than 35°F (2°C).
 - 2. Do not apply cement plaster to any frozen surfaces or surfaces containing frost.
 - 3. Do not apply Finish material beyond the limits of the Finish material manufacturer.
 - 4. Protect plaster coats against freezing for a period of 24 hours after application.
 - 5. Do not use frozen materials.
 - 6. Admixtures of cement plaster for cold weather condition must be approved and used in accordance of manufacturer's recommendations.
- H. Warm Weather Conditions:

1. Protect basecoats (scratch and brown coats) and Finish coat from uneven and excessive evaporation in warm, windy weather.
 - a. Moist curing is required.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.
- D. Protect adjacent areas/materials shall be protected from damage, drops and spills during the application of Finish materials.
- E. The materials shall be protected by permanent or temporary means from weather and other damage, prior to, during, and immediately after application.
 1. Care must be taken to prevent condensation and/or heat buildup when using tarp or plastic to prevent damage to the materials.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish additional fifteen (**15**) **year system** or approved alternate manufacturer's system written warranty signed by manufacturer agreeing to repair and/or replace finish coat work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 1. Wall framing and sheathing
 2. Wall penetrations
 3. Soffit/Ceiling penetrations
 4. Joint caulking at substrate
 5. Copings
- B. Related Sections include, but are not limited to, the following:
 1. Division 1
 2. Section 07 92 00 – Sealants and Caulking

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.
 - 3. Refer to finish material manufacturer's publications on Cleaning & Recoating for Finish.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 - 1. Lathing:
 - a. Product StructoLath: (Typical, U.N.O.)
 - 1) Structa Wire Corporation, www.structawire.com, 800.887-4708
 - b. Other product mfg'r's if not specifically noted:
 - 1) Stockton Products, www.stocktonproducts.com
 - 2) Amico, www.amico-lath.com
 - 3) CEMCO, www.cemco.com 925.473-9340
 - 4) Clark Western, www.clarkwestern.com
 - 2. Cement Plaster assembly and additives
 - a. Refer to product types for material and standards
 - b. BMI Products, www.bmi-products.com, Jerry Pozo, (510) 749-9089
 - c. BASF, Thoro www.thoroproducts.com
 - d. GIBCO www.gibco-use.com
 - 3. Lamina (Fiberglass Mesh)
 - a. BMI Products, www.bmi-products.com, Jerry Pozo, (510) 749-9089
 - 4. Finish Coat and associated materials
 - a. Dryvit, www.dryvit.com
 - b. Omega, www.omega-products.com
 - 5. Admixtures

- a. Dryvit, www.dryvit.com
 - b. BASF, Thoro Products, www.buildingsystems.basf.com/productdetailpage.asp
 - c. Gibco, www.gibco-usa.com
6. Accessories:
 - a. Stockton Products, www.stocktonproducts.com
 - b. Amico, www.amico-lath.com
 - c. CEMCO, www.cemco.com 925.473-9340
 - d. Clark Western, www.clarkwestern.com
 - e. Wall penetration boot/collar flashing:
 - 1) Quickflash Weatherproofing Products, Inc., www.quickflashproducts.com,
sales@quickflashproducts.com
7. Fasteners:
 - a. PASLODE and DUO-FAST brand names by Paslode, Vernon Hills, IL
 - b. GRIP-RITE, PRIMEAIR, FAS'NERS and UNLIMITED brand names by PRIMESOURCE Building Products, Carrollton, Texas, 75006
 - c. SENCO, GLOBAL and GPS brand names by SENCO, Cincinnati, Ohio
 - d. MASTER FASTENERS brand name by Master Fasteners International, LLC Long Beach, CA 90813
8. Cold Applied Self-adhering Waterproof Membranes
 - a. WR Grace, www.grace.com
 - 1) Refer to Section 07 13 26 – Cold Applied Self-Adhering Waterproof Membrane (CASAM)
 - 2) Quickflash Weatherproofing Products, Inc., www.quickflashproducts.com,
sales@quickflashproducts.com
9. Building Insulation
 - a. See Section 07 21 00 Building Insulation
10. Water Resistant Barrier
 - a. Refer to product types for material and standards
11. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.

- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. Sheathing

- 1. Refer to drawings and related specifications

B. Water Resistant Barrier Membrane (WRB)

- 1. Material: Heavy Asphalt-Saturated Building Paper

- a. Type: 1

- 1) Grade "D" water-vapor permeable, Style 2 uncreped, unreinforced, asphalt saturated paper.

- b. Testing: ER – 4947

- c. Rating: 60 minute per layer

- d. Weight: 3.5 pounds per 100 sq.ft. minimum per layer

- e. Layers: Two (2)

C. Insulation

- 1. As herein specified

D. Metal Lath Schedule

- 1. General: Per Building Code for galvanized lath type, weight, attachment & support spacing.

- a. **Vertical Conditions:** (Typically over 2 layers of Kraft 'D', 60 minute paper, u.n.o., except masonry and concrete)

- 1) **Wood framed Walls:**

- a) Gypsum sheathing substrate: Self-furring welded wire lath with double wire

- i. Mfg: Structa Wire Corporation

- ii. Product: 17ga. X 1-1/2" SF CR TT (Twin Track)

- iii. Roll Size: 38-3/8" x 150"

- iv. Material: Galvanized

- v. Fastening: Nails

- vi. Building Code Nomenclature: Diamond mesh expanded metal lath

- b) Plywood sheathing substrate: Self-furring welded wire lath with double wire

- i. Mfg: Structa Wire Corporation

- ii. Product: 17ga. X 1-1/2" SF CR TT (Twin Track)
- iii. Roll Size: 38-3/8" x 150"
- iv. Material: Galvanized
- v. Fastening: Nails
- vi. Building Code Nomenclature: Diamond mesh expanded metal lath
- c) No sheathing: Self-furring welded wire lath with double wire
- d) Backing: 16ga. Line/ tie wire @ 6"o.c. horizontally (galv'd annealed low-carbon steel)
- e) Lath: 17ga. X 1-1/2" SF CR TT (Twin Track)
- f) Building Code Nomenclature: Diamond mesh expanded metal lath

b. **Horizontal Conditions – Soffit and/or ceiling:**

1) **Wood framing:**

- a) Gypsum sheathing substrate:
 - i. 3/8" x 3.4lb. High Rib Lath @ over 16" o.c. to 24"o.c. max. framing spacing or
 - ii. 3.4lb. self-furring diamond mesh @ 16"o.c. maximum framing spacing
- b) Plywood sheathing substrate:
 - i. 3/8" x 3.4lb. High Rib Lath @ over 16" o.c. to 24"o.c. max. framing spacing or
 - ii. 3.4lb. self-furring diamond mesh @ 16"o.c. maximum framing spacing
- c) No sheathing:
 - i. 3/8" x 3.4lb. High Rib Lath @ over 16" o.c. to 24"o.c. max. framing spacing or
 - ii. 3.4lb. flat diamond mesh @ 16"o.c. maximum framing spacing

c. **Horizontal Conditions – Shelf and/or ledge:** (Typically over 2 layers of Kraft 'D', 60 minute paper, u.n.o., and over a sheet of Cold Applied Self-adhering Waterproof Membrane (CASAM), Refer also to Section 07 13 26 – Cold Applied Self-Adhering Waterproof Membrane (CASAM))

1) **Wood framing:**

- a) Gypsum sheathing substrate:
 - i. 3/8" x 3.4lb. High Rib Lath @ over 16" o.c. to 24"o.c. max. framing spacing or
 - ii. 3.4lb. self-furring diamond mesh @ 16"o.c. maximum framing spacing
- b) Plywood sheathing substrate:
 - i. 3/8" x 3.4lb. High Rib Lath @ over 16" o.c. to 24"o.c. max. framing spacing or
 - ii. 3.4lb. self-furring diamond mesh @ 16"o.c. maximum framing spacing
- c) No sheathing:

- i. 3/8" x 3.4lb. High Rib Lath @ over 16" o.c. to 24" o.c. max. framing spacing or
 - ii. 3.4lb. flat diamond mesh @ 16" o.c. maximum framing spacing
- E. Lamina
 - 1. Material: Fiberglass reinforced mesh
- F. Skim Coat
 - 1. Material: Polymer Cement
- G. Material – Finish Coat Type and application:
 - 1. Application: Trowel Applied
 - a. Schedule:
 - 1) **Elastomeric Acrylic Finish**
 - a) Option 1a - Dryvit:
 - i. Mfgr: Dryvit
 - ii. Material: 100% Acrylic-Based Aggregate Textured Elastomeric Finish utilizing DPR technology and Elastomeric binders
 - iii. Flexibility Standard: ASTM D 522 Method B – Passed: 1.0" dia. @ 73 degrees F
 - iv. Product: Weatherlastic
 - v. Reference Numbers:
 - a. Product: DS 418
 - b. Spec: DS 139
 - c. MSDS: #140
 - vi. Application: Warm to hot weather
 - a. Air and wall temperature: 40 degrees F minimum
 - vii. Limitations: Do not use in cold weather
 - viii. Color:
 - a. General:
 - i). Refer top drawings for locations
 - ii). Integral for each indicated custom color
 - b. Color(s)
 - iii). [Fill in]
 - iv). [Fill in]
 - ix. Finish:
 - a. Weatherlastic Sandpebble Fine

- x. Accessory Dryvit Materials – including, but not limited to;
 - a. Weathercoat Acrylic Coating
 - b. Weatherprime Acrylic Primer
 - c. Weatherpatch Patching compound
 - d. Clean and potable water
- xi. Primer:
 - a. For cement plaster substrates that contain an additive
 - b. Over patched locations

2. **Application: Spray Applied**

a. Schedule:

- 1) Refer to Section 09 96 53 – Elastomeric Sprayed Finish System

H. Flexible Flashing

1. Typical:

- a. Install in accordance with Section 07 13 26 – Cold Applied Self-Adhering Waterproof Membrane (CASAM)

2. Material:

- a. Product Type: Cold-applied, self-adhereing Waterproof membrane Underlayments and flashing (CASAM)

I. Accessories

1. Fasteners:

a. General:

- 1) Accessories shall be fabricated from material as herein specified.
- 2) Depth (the grounds) of accessories depends on the required thickness of cement plaster basecoat, without the finish coat.
- 3) If the construction documents do not indicate the type of accessories to be installed, the plastering contractor shall select the accessories in accordance with NWCB standards.
- 4) It is required that aluminum reveals, when used in conjunction with 2 inch X 2 inch welded wire lath, incorporate a strip of Diamond Mesh metal lath over the reveal flanges.

b. Materials:

- 1) Refer to system installation general heading.

2. Wall penetration prefabricated boots:

- a. Product: Quickflash Weatherproofing Products

- b. Material: Blend of HDPE & LDPE
- c. Models: Select from mfg's models for specific wall penetration.
- d. Application:
 - 1) Pipe penetrations
 - 2) Wall boxes for line and low voltage
 - a) Rectangular and round
- 3. Screeds, Reveals (accessories, as listed below & indicated on documents)
 - a. Gauge & Finish:
 - 1) All accessories are as herein indicated to be Zinc unless noted otherwise.
 - a) **Zinc:** Typical
 - b) **Aluminum:** Acceptable option to zinc if zinc not available
 - c) **PVC:** Only allowed if approved by **Architect.**
 - 2) Material: As herein specified
 - a) Coordinate with wall finish specifications and painting specifications
 - 3) Finish: Painted
 - a) Coordinate with wall finish specifications and painting specifications
 - b. Size: All are set for overall 7/8" thick cement plaster and finish assembly.
 - c. Manufacturers:
 - 1) AL: Amico Lath
 - 2) CC: Cemco
 - 3) CW: Clark Western
 - 4) SP: Stockton Products
 - d. Shape: All specified accessories which have return lip shall not be substituted with ones without.
 - e. Schedule: (including, but not limited to)
 - 1) VERTICAL Plane Conditions:
 - a) Supply accessories in size to accommodate finish wall thickness

	Condition	Mfgr	Model	Mat'l/ Alloy	Alternates
1.	<u>Corner Bead (inside & outside) – Not Used</u>				
a.	Corner Bead (Outside) - Expanded Metal	Amico	X-2	Zinc	CC - #2A

b.	Corner Reinforcing (Inside) - Expanded Flange .Metal	Amico	Smooth Edge Cornerite (3" wide flanges)	Galv	CW - Cornerite CC – Smooth Edge Cornerite
c.	Inside Corner Expansion (Exposed)	Amico	Inside Corner Expansion/Control Joint	Zinc	CW - #30 CC – #30
d.	Expansion/Slip Joint - Inside Corner	Stockton Products	CSJ	Zinc	Approved equivalent in Zinc

2.	<u>Soffit Drip– Not Used</u>				
a.	Drip	Stockton Products	#5 Drip, NFD	Zinc.	Approved equivalent in Zinc

3.	<u>Control Joints (fixed 3/8" reveal) – Not Used</u>				
a.	Double 'J' Control Joint (Walls) – Fixed Gap (horizontal) w/ removable tape	Amico	Griplock "J"	Zinc.	CW – XJ15
b.	Double 'J' Control Joint (Walls) – Fixed Gap(vertical) w/ removable tape	Amico	Griplock "J"	Zinc.	CW – XJ15
c.	Double 'J' Control Joint (Ceilings/soffits) – Fixed Gap(vertical) w/ removable tape	Amico	Griplock "J"	Zinc.	CW – XJ15

4.	<u>Casing Bead (Expanded Diamond Mesh Flange) – Not Used</u>				
a.	Casing Bead / plaster stop w/o Weep Holes	Amico	X-66	Zinc.	CW - #66

5.	<u>Expansion Joints (Slip Joints) – Not Used</u>				
a.	Horizontal: 2-piece adjustable Expansion/Control Slip Joint install with 1/4" dia. weep holes at 3" o.c. at drip conditions	Amico	2-Piece Expansion Joint (#40 Type) x 3/8" Gap	Zinc.	CW - #40 SP - #40SL (EWC)
b.	Horizontal: 2-piece adjustable Expansion/Control Slip Joint (Gap = 3/8") install with 1/4" dia. weep holes at 3" o.c. at drip conditions	Amico	2-Piece Expansion Joint (#40 Type x 3/8") Gap	Zinc.	CW - #40 SP - #40SL (EWC)

6.	<u>Window/Door Head Drip</u>				
a.	Drip	Stockton Products	WTP - 1"(x dim) - 4" flange (y dim)	Zinc.	Approved equivalent in Zinc

7.	<u>Wall Transition Banding Bead</u>				
a.	Horizontal Banding Bead	Stockton Products	Z – Trim, model Z-T <ul style="list-style-type: none"> • 2" bottom leg (x dim) • 1" depth (y - dim) • ¾" top flange 	Zinc.	Approved equivalent in Zinc

8.	<u>Base of Wall Drip (WEEP)</u>				
a.	"J" Bead – Cement Plaster (w/ 3-1/2" or 5" flange)	Stockton Products	J- Bead w/ ¼" dia. Weep holes	Zinc.	Approved equivalent in Zinc
b.	"J" Bead – Rigid Insulated & Cement Plaster System with 3-1/2" flange	TBD	J- Bead w/ ¼" dia. Weep holes	Zinc	Approved equivalent in Zinc to contain foam & cement plaster

9.	<u>Reveals– Not Used</u>				
a.	[TBD]	Fry Reglet	[TBD]	Zinc. or Alum.	Approved equivalent in Zinc

2) HORIZONTAL Plane Conditions

1.	<u>Corner Beads– Not Used</u>	Refer to "VERTICAL Plane Conditions" Heading
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2.	<u>Soffit Drip– Not Used</u>	Refer to "VERTICAL Plane Conditions" Heading
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3.	<u>Control Joints– Not Used</u>	Refer to "VERTICAL Plane Conditions" Heading
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4.	<u>Casing Bead– Not Used (Expanded Diamond Mesh Flange)</u>	Refer to "VERTICAL Plane Conditions" Heading
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5.	<u>Expansion Joints (Slip Joints) – Not Used</u>	
a.	Horizontal: 2-piece adjustable Expansion/Control Slip Joint (Do not install with weep holes)	Refer to "Vertical Plane Conditions" Heading
b.	Horizontal: 2-piece adjustable Expansion/Control Slip Joint	Refer to "Vertical Plane Conditions" Heading

	(Do not install with weep holes)	
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6.	<u>Expansion Screed Channel – Vented – Not Used</u>				
a.	Expansion Screed – Vented (Horz. to Horz. plane)	Stockton Products	ECS • 7/8" stucco thk. • 1/8" dia. holes • Vent Width: 4"	Zinc	N/A

7.	<u>Single Point Screed – Not Used</u>				
a.	Single Point Screed	Stockton Products	PBS • 7/8" stucco thk. • 5/8" leg dim.	Zinc	N/A

8.	<u>Soffit Channel – Vented – Not Used</u>				
a.	Soffit Channel at soffit	Stockton Products	PCS • 7/8" stucco thk. • 1/8" dia. holes • Vent Width: 4"	Zinc	N/A
b.	Soffit Channel at wall	Stockton Products	FRM (F Vent) • 7/8" stucco thk. • 1/8" dia. holes • Vent Width: 4"	Zinc	N/A

9.	<u>Reveals – Not Used</u>				
a.	[TBD]	Fry Reglet	[TBD]	Zinc. or Alum.	Approved equivalent in Zinc

J. Cement Plaster Mix Design – Scratch and Brown Coats

1. Schedule:

a. **Assembly: Mix design per NWCB**

1) Mix Design: Scratch and Brown

a) **Component:**

i. Portland Cement:

a. Material: Portland Cement type I or Type I/II,

b. Proportions:

- i). Scratch: 1 bag
 - ii). Brown: 1 bag
 - c. Standard: ASTM C150
- ii. Lime Substitute:
 - a. Material: Type "S" compliant,
 - b. Proportions:
 - i). Scratch: 3 ounces
 - ii). Brown: 3 ounces
 - c. Product:
 - i). Mfgr: Gibco
 - ii). Product: RPF
 - d. Standard: ANSI A 42.2 and ANSI A42.3 Type C
- iii. Sand (Aggregate):
 - a. Material:
 - i). Natural or manufactured sand
 - ii). Fresh water washed and free of deleterious materials.
 - iv. Locally available sand.
 - v. Do not use frozen aggregate.
- b) Proportions:
 - i. Scratch: 2-1/2 – 4 cubic feet
 - ii. Brown: 3 – 5 cubic feet
 - a. Standard: Standard: ASTM C144
 - iii. Water:
 - a. Material: Clean potable water
 - b. Proportions: per mfgr. recommendations
 - iv. Admixtures:
 - a. Proportions: per mfgr. recommendations
 - b. Material:
 - i). Fibers:
 - a. 1/2" x 13mm long
 - b. Polypropylene, nylon or alkali-resistant fibers

- c. Recommended as part of basic basecoat mix.
 - d. Only in basecoats, not in finish coat.
 - e. Use only types specifically manufactured for a cement plaster basecoat and per manufacturer's recommendations.
 - f. Standard: ASTM C1116 compliant
- c. Enhancing emulsion:
 - i). Proportions: per mfgr. recommendations
 - ii). Product:
 - a. Mfgr: BASF, Thoro Products
 - b. Product: ACRYL 60
 - iii). Mix: Per mfgr. recommendations
- d. Additional options for admixtures, refer to ADMIXTURES heading.
- v. Coats of Cement Plaster
 - a. Two coats (Scratch and Brown) with third Finish Coat at exposed conditions as herein specified.

2.3 MATERIALS – RIGID INSULATED CEMENT PLASTER WALL ASSEMBLY

- A. Sheathing: Refer to Section 09 29 00 – Gypsum Board & Sheathing Substrates
- B. Water Resistant Barrier (WRB): As herein specified
- C. Assembly:
 - 1. System: PWA 104
 - a. Assembly design governing body
 - 1) Western Conference of Wall and Ceiling Institute, Technical Services Information Bureau
 - 2. Components
 - a. Rigid foam with drainage channels on backside
 - 1) Application: Installed over WRB
 - 2) Manufacturer: Dow Corning
 - 3) Type: Extruded
 - 4) Material: Polyisocyanurate
 - 5) Model: Formular XPS 250
 - 6) Layers: One (1)
 - 7) Thickness/R-Value:

- a) 1" 6.7
- b) 1.5" 10.5
- c) 2" 14.4
- 8) Drainage Grooves: Yes
- b. Fasteners:
 - 1) Material: Corrosion Resistant
 - 2) Type: Self-drilling wafer head x length to penetrate wall framing with 3 fastener threads
- c. Self-furring lath: As herein specified
- d. Scratch and finish coat: As herein specified
- e. Lamina
 - 1) Material: Fiberglass reinforced mesh
 - a) Mfgr: BMI
 - b) Product: Lamina
 - c) Weight: 6 oz.
- f. Polymer cement skim coat
 - 1) Application: Use to set fiberglass to face of rigid insulation
 - 2) Mfgr: BMI
 - 3) Product: C.P. Mix
- g. Finish coat: As herein specified

2.4 OTHER MATERIALS

A. Material - Admixtures

- 1. General
 - a. No household-type detergents or chlorides shall be permitted.
 - b. Only admixtures manufactured specifically for use in a cement plaster mix shall be permitted.
 - c. Admixtures without supporting documentation and appropriate testing or industry performance will not be approved.
 - d. Lime not allowed.
- 2. Air-entraining mixtures:
 - a. ASTM C260 compliant
 - b. Use only products approved by the NWCB
 - c. Amount used shall be consistent with manufacturer's recommendations.

3. Water-reducing admixtures:
 - a. ASTM C494, Type A compliant
 - b. Use only products approved by the NWCB
 - c. Amount used shall be consistent with manufacturer's recommendations.
4. Accelerating admixtures
 - a. ASTM C494, Type c and E compliant
 - b. Use only products approved by the NWCB
 - c. Must be non-chloride or chloride with rust-inhibitors.
 - d. Amount used shall be consistent with manufacturer's recommendations.
5. Pump-aid admixtures
 - a. Amount used shall be consistent with manufacturer's recommendations.
 - b. Use only products approved by the NWCB
- B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.
 1. Wall penetration boot/collar flashing:
 - a. Mfgr: Quickflash Weatherproofing Products, Inc.
 - b. Material:
 - 1) Panel:
 - a) Composite of;
 - i. High-Density polyethylene (HPDE)
 - ii. Low-Density polyethylene (LDPE)
 - 2) Weatherproof Seal: Thermoplastic elastomer
 - c. Products:
 - 1) Electrical box flashing collar/boot panels
 - 2) Plumbing pipe flashing collar panels
 - 3) Conduit flashing collar panels
 - d. Models:
 - 1) P Series for pipe and conduit penetrations
 - 2) E Series for electrical boxes
 - 3) Other conditions, refer to manufacturer's literature
 2. Crack Patching
 - a. Mfgr Dryvit or approved by finish manufacturer

- b. Product: Material approved by finish manufacturer for finish system to be installed
- 3. Primer:
 - a. Mfgr Dryvit or approved by finish manufacturer
 - b. Product: Material approved by finish manufacturer for finish system to be installed
- 4. Other products as required for the specific finish including, but not limited to these by Dryvit or approved by finish manufacturer;
 - a. Demandit
 - b. Color Prime
 - c. Weathercoat Acrylic Coating
 - d. Weatherprime Acrylic Primer
 - e. Weatherpatch Patching compound
 - f. Clean and potable water
 - g. Base coat and adhesive surface treatment prior to Lath and Cement Plaster installation.
 - h. Material
 - 1) Manufacturer: Dryvit
 - 2) Product: Dryflex
 - 3) Thickness: 3/32"
 - 4) Number: DS430
 - 5) Composition: High percentage polymer-blend
 - i. Crack repair prior to bond coat
 - 1) Mfgr: Dryvit
 - 2) Product: Dryflex
 - 3) Number: DS419
- 5. Framing Accessories
 - a. Tie Wire
 - 1) Hanger and tie wire to be galvanized and annealed low-carbon steel: FSQQ-W-461g. AS
 - a) Hanger wire No. 8 – 0.1620 inch
 - b) Tie wire 16 gauge – 0.0625 inch
 - b. Runner And Cross-Furring Channels
 - 1) Cold-rolled galvanized steel channels
 - a) Size: 1 ½ inches and ¾ inches

- b) Strength: 33,000 psi yield strength, minimum
- c) Thickness: 0.0538 inch bare steel thickness, minimum
- 2) Suspended soffits/ceilings:
 - a) Size:
 - i. Main Runner: 1 ½ inch
 - ii. Cross Furring: ¾"
- c. Furring "Hat" Channels
 - 1) Furring channel:
 - a) Material: Galvanized
 - b) Size: 7/8 inch
 - c) Gauge: 20
- d. Fasteners
 - 1) Typical: Galvanized
 - 2) Concrete & Concrete Masonry: Stainless Steel

PART 3 - EXECUTION

3.1 INSPECTION/EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 MOCK-UP

- A. Erect at location approved by **Architect**.
 - 1. Mock-up shall not be part of final construction once approved by **Architect**.
- B. Mock-up
 - 1. Size: One (1) 4' x 4' panel for each color & texture.

2. Mock-up panels shall demonstrate minimum quality range of colors, texture and workmanship that shall be expected in completed work or subject to rejection by **Owner** and/or **Architect** and reinstallation by **General Contractor** at no additional cost or schedule delays.
 - a. **Architect's** acceptance of one or more of sample panel's visual quality must be obtained before starting plasterwork.
 - b. Retain panels at project site during construction as a standard for judging finish of completed work.
3. Schedule
 - a. Stud Framing:
 - 1) Size: 48" x 48" x 7/8" thick
 - 2) Assembly:
 - a) Finish coat over/
 - b) Brown coat over /
 - c) Scratch Coat over /
 - d) Wire lath over;
 - e) Water resistant barrier Underlayment paper and CASAM over:
 - f) Insulation over/
 - g) Sheathing over /
 - h) Framing, with
 - i) Reveals, expansions screed, J molds, etc. to represent overall assembly with painted finish.
 - j) With cold applied self-adhering membrane flashing as specified and/or detailed.
 - i. Refer also to Section 07 13 26 – Cold Applied, Self-Adhering Waterproof Membrane (CASAM).

3.5 INSTALLATION GENERAL

A. General

1. Guidelines and requirements:
 - a. Install components in accordance with manufacturer's recommendations, these specifications and as indicated in drawings.
 - b. Install in accordance with Northwest Wall and Ceiling Bureau (NWCB), Portland Cement Plaster STUCCO Guide unless herein required to be more restrictive.
 - c. Install in accordance with building code.
 - d. Most restrictive requirements shall govern between code, NWCB and drawings.
2. Coordination:

- a. Carefully coordinate with other trades to assure proper provision in such work for installation of the work of this Section.
 - b. Provide embedded wire and other supports as necessary.
 - c. Install appropriate approved transition trim around all wall penetrations.
 3. Surface Conditions
 - a. Prior to starting lathing or plastering work, carefully inspect installed work of other trades to verify that work is complete to the point where work of this section may properly commence.
 - b. Notify the **Architect** or proper authorities in writing of conditions detrimental to the proper and timely completion of the lathing and/or plastering work.
 - c. Do not begin installation until all unsatisfactory conditions are resolved.
 - d. A pre-construction meeting is required with the **Architect**, **Owner**, primary **General Contractor** and representatives responsible for the windows, framing, flashing, roofing, sealants, cement plaster and any other building components interfacing with the cement plaster assembly.
 4. Install members, flexible flashings, flashing, and components in strict accordance with arrangements shown on the Drawings and the manufacturer's recommendations as reviewed by the **Architect**.
 5. Alignment: Tolerance variation shall not be collective.
 - a. Align vertically within a tolerance of one in 1000.
 - b. Align horizontally within a tolerance of one in 500.
 6. Lathing application, refer to METAL LATH SCHEDULE and NWCB for minimum requirements and how modified herein to be more stringent.
- B. Typical Assembly
1. Accessories:
 - a. Install wall penetration boot/collar flashings as herein specified and/or detailed.
 2. Sheathing: At walls typical and installed by others
 3. Water Resistant Barrier (WRB):
 - a. Install water-resistant barrier underlayment
 - 1) Coordinate with installation of waterproof membrane and flexible flashing.
 - 2) Install two separate base layers over entire substrate sheathing.
 - a) Install directly over wall framing when no substrate sheathing is present and install over Cold applied self-adhering waterproof membrane and flexible flashing tight, smooth and without breaks behind trim accessories.

- i. Coordinate with details for conditions that require cold applied self-adhering waterproof membrane and flexible flashing to be installed over water resistant barrier.
 - ii. Coordinate with details for conditions that require cold applied self-adhering waterproof membrane and flexible flashing to be installed over control joints, expansion joints, casing beads and/or drip molds, etc.
 - b) Install two separate layers of the water-resistant barrier layers and overlap seams;
 - i. Horizontal joints a minimum of 6" o.c.
 - ii. Vertical joints a minimum of 12"
 - c) Install the water-resistant barrier layers in shiplap fashion.
 - d) Install self-adhering cold applied self-adhering waterproof membrane strips at all openings in conjunction with the water resistant barrier and fit together in shiplap fashion.
- b. Rigid Foam Insulation Layer
 - 1) System: See Section 7 Building Insulation
 - a) Skim Coat: Yes
 - b) Fiberglass Mesh: Yes
 - 2) Rigid Insulation:
 - a) Install rigid insulation over WRB with fasteners in field and along edges.
 - i. Fastener Type: Non-corrosive
 - ii. Type:
 - iii. Length:
 - a. Adequate enough to penetrate wood x 5/8"
 - b. Adequate enough to penetrate metal framing x 1/4"
 - 3) Flexible Flashing:
 - a) Install Cold Applied Self-Adhering Waterproof Membrane (CASAWM) and flexible flashing:
 - 4) General:
 - a) Coordinate with installation of water-resistant barrier underlayment
 - 5) Schedule:
 - a) Door and window openings:
 - i. Install in accordance with flexible flashing membrane manufacturer's recommendations
 - ii. Install in water shedding ship-lap fashion.

- b) Dissimilar Material:
 - i. Install strip of waterproof membrane underlayment or flexible flashing over the top of water resistant barrier and substrate at all edge conditions where plaster adjoins a dissimilar material.
 - ii. Allow for 3" width of adhesion of cold applied self-adhering waterproof membrane to substrate sheathing, unless required otherwise by manufacturer.
 - iii. Install in continuous strips as is physically capable.
 - iv. Install in shiplap fashion typically.
- c) Install cold applied self-adhering waterproof membrane at locations herein indicated, on Drawings as indicated including, but not limited to:
 - i. Non-Insulated Assembly:
 - a. All horizontal conditions
 - b. Below water resistant barrier and over substrate
 - c. Below lath and plaster finish at locations indicated on drawings, typical
 - d. Around all wall and soffit penetrations.
 - e. Around all windows and doors
 - f. At locations indicated and/or noted on Drawings
 - g. Overlap onto flanges of all screeds, reveals expansion joints, etc. Unless detailed otherwise.
 - h. Horizontal sills
 - i. Top of walls
 - j. Below copings and wrapped down each side of wall
 - ii. Insulated Assembly
 - a. See Section 7 Building Insulation
- d) Installation
 - i. Allow for 3" width of adhesion of cold applied self-adhering waterproof membrane to substrate sheathing, unless required otherwise by manufacturer.
 - ii. Install in continuous strips as is physically capable.
 - iii. Install in shiplap fashion typically.
 - iv. Install on top of substrate sheathing and below lath, paper and plaster assembly.
 - a. Coordinate with details
 - v. Overlap membrane a minimum of 6" o.c. down the face of all vertical planes.
 - vi. Overlap membrane joints a minimum of 6" o.c.

- vii. Do not put in contact with PVC roofing membranes.
- c. Lath and accessories attachment schedule:
 - 1) General:
 - a) Attach to support framing and solid masonry substrates using galvanized fasteners as herein specified and in accordance with Building Code and Plaster and Lathing Systems Manual (NWCBS) to prevent dislodging and misalignment during subsequent operations.
 - b) Install lath and accessories together in accordance with building code, drawings and as herein specified.
 - c) Additionally, refer to METAL LATH SCHEDULE heading for required lath types.
 - 2) Schedule:
 - a) Wall Framing / structural construction:
 - i. **Wood framed Walls:**
 - a. General:
 - i). Overlap horizontal edges of lath per manufacturer's recommendations.
 - ii). Fasteners shall engage twin wire portion of the lath and secure into framing.
 - iii). Wrap lath around all inside and outside vertical and horizontal corners/edges a minimum of 16" each side.
 - b. Lath:
 - i). Self-furring welded wire lath with double wire (SF CR TT)
 - a. Fasteners:
 - b. Types:
 - c. Nails: No. 11 gauge barbed nail with 7/16" diameter head by length to penetrate wood stud by 3/4" min.
 - d. Staples: 3/4" crown with length long enough to penetrate 3/4" minimum into wood stud framing
 - e. Fastening: 6" o.c. typ. Along framing 4" o.c. at 24" o.c. wall framing along framing
 - f. Notes:
 - g. Maximum spacing of attachments from longitudinal edges shall not exceed 2".
 - ii). 3/8" high rib lath

- a. Fasteners: No. 11 gauge barbed nail with 7/16" diameter head by length to penetrate wood stud by $\frac{3}{4}$ " min.
 - b. Fastening: 6" o.c. typ. Along framing 4" o.c. at 24" o.c. wall framing along framing
 - c. Notes:
 - d. Maximum spacing of attachments from longitudinal edges shall not exceed 2".
 - e. Approved wire and sheet metal attachment clips may be used.
 - c. Trim accessories: 8 – 12" o.c.
 - d. Expansion joints: 12" o.c. staggered
 - e. Control joints: 12" o.c. staggered
 - f. Corner reinforcing: 12" o.c.
 - g. Seismic:
 - i). Install additional fasteners in accordance with building code seismic requirements and building official having jurisdiction.
- b) **Horizontal conditions:**
- i. Wood framing
 - a. General:
 - 1. Overlap lateral edges of lath per manufacturer's recommendations
 - b. Lath:
 - i). 3/8" high rib
 - a. Fastener: No. 11 gauge barbed nail with 7/16" diameter head by 1-1/2" long.
 - b. Fastening: 6" o.c. typ. Along framing 4" o.c. at 24" o.c. wall framing along framing
 - c. Trim accessories: 8 – 12" o.c.
 - d. Expansion joints: 12" o.c. staggered
 - e. Control joints: 12" o.c. staggered
 - f. Corner reinforcing: 12" o.c.
 - g. Seismic:
 - i). Install additional fasteners in accordance with building code seismic requirements and building official having jurisdiction.
 - h. Where backing sheathing is not provided at wood framing, install before lath. Line/tie wire perpendicular to framing at 6' o.c. horizontally and secure to each framing member with same fasteners as lath.

- i. Overlap line/tie wire a minimum of one framing bay.
- c) **Wood sheathing substrate**
 - i. Wood framing
 - a. General:
 - i). Overlap lateral edges of lath per manufacturer's recommendations
 - b. Lath:
 - i). 3/8" high rib
 - a. Fastener: No. 11 gauge barbed nail with 7/16" diameter head by 1-1/2" long.
 - b. Fastening: 6" o.c. typ. Along framing 4" o.c. at 24" o.c. wall framing along framing
 - c. Trim accessories: 8 – 12" o.c.
 - d. Expansion joints: 12" o.c. staggered
 - e. Control joints: 12" o.c. staggered
 - f. Corner reinforcing: 12" o.c.
 - g. Seismic:
 - i). Install additional fasteners in accordance with building code seismic requirements and building official having jurisdiction.
 - h. Where backing sheathing is not provided at wood framing, install before lath. Line/tie wire perpendicular to framing at 6' o.c. horizontally and secure to each framing member with same fasteners as lath.
 - i. Overlap line/tie wire a minimum of one framing bay.

3.6 INSTALLATION - WALL PENETRATION BOOTS/COLLAR FLASHING

- A. Select appropriate model for specific conduit, pipe and/or electrical box size.
- B. Install flashing boot/collar panels in accordance with manufacturer's instructions.
- C. General:
 - 1. Conduits:
 - a. One (1) Piece Flashing panel:
 - 1) Select flashing panel required for specific conduit size.
 - 2) Push 1 piece flashing panel over conduit with label facing to exterior to form a weathertight seal around conduit.
 - b. Two (2) Piece Flashing panel:
 - 1) Cut flashing panel scores (at penetration) to size of conduit

- 2) Place bottom panel under conduit.
 - 3) Snap top panel to bottom panel over conduit.
 - 4) Caulk pipe to flashing panel with Dow Corning 795 in accordance with Section 07 92 00.
2. Pipes:
 - a. One (1) Piece Flashing panel:
 - 1) Select flashing panel required for specific pipe size.
 - 2) Push 1 piece flashing panel over pipe with label facing to exterior to form a weathertight seal around conduit.
 - b. Two (2) Piece Flashing panel:
 - 1) Cut flashing panel scores (at penetration) to size of pipe.
 - 2) Place bottom panel under pipe.
 - 3) Snap top panel to bottom panel over pipe.
 - 4) Caulk pipe to flashing panel with Dow Corning 795 in accordance with Section 07 92 00.
3. Electrical Boxes:
 - a. Select flashing panel required for specific box size.
 - b. Push flashing panel over electrical box with label facing to exterior to form a weathertight seal around box.
 - c. Ensure that flashing panel collar edge is flush with electrical box outer edge.
- D. Weather Barriers:
 1. Two (2) layer applications:
 - a. Place weather barrier up behind bottom of flashing panel to bottom of conduit, pipe and/or box.
 - b. Install 3" wide cold applied self-adhering membrane strip centered over edge of flashing panel and onto wall substrate adhering to both surfaces and onto weather barrier installed under bottom of flashing panel.
 - 1) Prime substrate in accordance with cold applied self-adhering membrane manufacturer's recommendations.
 - c. Place second layer of weather barrier over top of flashing panel to bottom front edge or further down.
 2. One (1) layer cold applied self-adhering membranes:
 - a. Place membrane such that membrane overlaps onto flange of flashing panel and adheres to panel and substrate.

- 1) Prime substrate in accordance with cold applied self-adhering membrane manufacturer's recommendations.

- b. At membrane seams install in shi lap fashion over flashing panel.

3.7 INSTALLATION - PORTLAND CEMENT PLASTER SYSTEM AND FINISH COATING

A. General:

1. Perform mixing, plastering, and plaster curing in strict accordance with provisions of the referenced standards and as follows:
 - a. Climatic conditions dictate the need for moist-curing.
 - 1) Cement plaster basecoat to cure for a minimum of seven days before starting finish coat application.
 - b. Moist-curing is recommended at one or all of the following conditions:
 - 1) When the ambient temperature is 77°F (25°C) or higher
 - 2) When the ambient relative humidity is below 70 percent
 - 3) When it is windy.
 - c. Moist curing guidelines:
 - 1) Moist-cure in the morning and late afternoon for a period of two days. (48 hours)
 - 2) Moist-cure with a fine mist of clean water; do not saturate.
 - 3) Moist-cure only after the basecoat has set and is hard.
 - 4) Extreme weather conditions may require plastic sheets to retard evaporation.
 - d. The cement plaster basecoats should be protected from freezing for a period of 24 hours after application.
 - 1) Do not moist-cure if basecoat is subject to freezing.
 - 2) Do not use frozen materials in mix.
 - 3) Do not apply cement plaster to a surface that is frozen or contains frost.
 - e. Mix only as much plaster as can be used prior to initial set.
 - f. Combine materials dry, to uniform color and consistently before adding water or additive substitute, refer to mix design.
 - g. Protect mixes from freezing, frost, contamination and evaporation.

B. 1st. coat - Scratch coat (3/8" thick): (Basecoat)

1. Mix with specified Admixtures per mfg's recommendations.
2. Apply with sufficient material and force to form good keys, embedding and filling all spaces of the lath.
3. Score to receive the brown coat.

4. Cure 1st coat for (48) hours.
 - a. This can be reduced in accordance with the "Alternate Double-Back Method" in accordance with Building Code.
 - b. 1st coat to be hard and rigid prior to Brown coat installation..
 5. Verify that trim accessories and lath are properly secured.
 6. Verify trim accessories and lath are installed so as to provide proper screeds, thickness and alignment for the plastering operation.
 7. Do not begin plastering work until satisfactory conditions are resolved.
 8. Apply basecoat to entire wall panel and/or section without interruption or "cold joints."
 9. Install cement plaster basecoat in accordance with the requirements and references in this Specification and the project construction documents.
 10. Do not change selected mix or proportions after plastering operation has started.
 11. Measurement of ingredients (materials of the mix) to be done with devices of known volume, accurate and successive batches proportionally alike.
 12. Use only enough mix liquid to make plaster a workable consistency.
 13. Admixtures are for improving the basecoat mix or enhancing the plaster application. Use products manufactured strictly for this purpose and in accordance with manufacturer's recommendations.
- C. 2nd Coat - Brown coat (3/8" thick – 3/4" overall thickness):
1. Mix with specific Admixtures per mfg's recommendations.
 2. Bring out to grounds (allow room for finish coat), straighten to a true surface, and even within a tolerance of one in 500. Leave surface with a float finish free from tool marks and any other blemishes.
 3. Any deviation in surface finish or alignment tolerance shall be corrected before final cleaning has begun.
 4. Apply this coat with sufficient material and pressure to ensure a tight uniform bond to scratch coat.
 5. Rod the Brown coat to a true, even plane, filling surface defects with cement plaster.
 6. Verify that trim accessories and lath are properly secured.
 7. Verify trim accessories and lath are installed so as to provide proper screeds, thickness and alignment for the plastering operation.
 8. Do not begin plastering work until satisfactory conditions are resolved.
 9. Apply brown coat to entire wall panel and/or section without interruption or "cold joints."
 10. Install cement plaster Brown coat in accordance with the requirements and references in this Specification and the project construction documents.

11. Do not change selected mix or proportions after plastering operation has started.
 12. Measurement of ingredients (materials of the mix) to be done with devices of known volume, accurate and successive batches proportionally alike.
 13. Use only enough mix liquid to make plaster a workable consistency.
 14. Admixtures are for improving the Brown coat mix or enhancing the plaster application. Use products manufactured strictly for this purpose and in accordance with manufacturer's recommendations.
 15. Finish wall tolerance shall be less than 1/8" in 10 feet for plumb level, wrap and/or bow. Tolerances variation shall not be collective.
 - a. Level of finish shall be in accordance with finish coat manufacturers requirements prior to proceeding with finish coat.
 16. Curing 2nd coat – Brown coat for 7 days prior to installation of 3rd coat – Finish coat.
- D. 3rd Coat - Finish Coat (overall 7/8" finish thickness)
1. Trowel Applied:
 - a. Application:
 - 1) 100% Acrylic-Based Aggregate Textured Elastomeric Finish utilizing DPR technology and Elastomeric binders:
 - a) Schedule:
 - i. Install in accordance with manufacturers recommendations/Specifications and as herein specified.
 - a. Do not install on wall substrate until satisfactory finish is achieved.
 - b. Use Dryvit approved product as necessary to bring substrate finish up to acceptable level.
 - ii. Install with Steel trowel.
 - iii. Do not apply finish coat sooner than (7) days after installation of the brown coat.
 - iv. Bring out to grounds; straighten to a true surface, and even within a tolerance of one in 500. Leave surface with a smooth float finish, free from tool marks and any other blemishes and ready to accept finish.
 - v. Any deviation in surface finish or alignment tolerance shall be corrected before final cleaning has begun.
 - a. Re-finish shall extend to nearest panel break at a physical joint, not in the field of a panel.
 - vi. Finish wall tolerance shall be less than 1/8" in 10 feet for plumb level, wrap and/or bow.
 - a. Tolerances variation shall not be collective.

2) 100% Acrylic:

a) Schedule:

- i. Install in accordance with manufacturers recommendations/Specifications and as herein specified.
 - a. Do not install on wall substrate until satisfactory finish is achieved.
 - b. Use Dryvit approved product as necessary to bring substrate finish up to acceptable level.
- ii. Install with Steel trowel.
- iii. Do not apply finish coat sooner than after brown coat is fully cured and (7) days after installation of the brown coat.
- iv. Bring out to grounds (level to the grounds and locked into screeds), straighten to a true surface, and even within a tolerance of one in 500.
 - a. Leave surface with a smooth float finish, free from tool marks and any other blemishes and ready to accept finish.
- v. Any deviation in surface finish or alignment tolerance shall be corrected before final cleaning has begun.
 - a. Re-finish shall extend to nearest panel break at a physical joint, not in the field of a panel.
- vi. Finish wall tolerance shall be less than 1/8" in 10 feet for plumb level, wrap and/or bow.
 - a. Tolerances variation shall not be collective.
- vii. Apply only after ambient temperature has been maintained for 24 hours at 50°F and weather is dry.

3.8 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.

- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 09 24 00

SECTION 09 29 00 – GYPSUM BOARD AND SHEATHING SUBSTRATES

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the job site.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Interior: Gypsum wallboard and sheathing
 - 2. Exterior gypsum sheathing
 - 3. Joint treatment
 - 4. Surface treatment – Interior
 - 5. Surface treatment and fastener treatment – Exterior
 - 6. Sealants and Backer rod
 - 7. Drywall Primer / Sealer
 - 8. Related accessories

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society For Testing and Materials (ASTM) www.astm.org
 - 1. ASTM C 36 Specification for Gypsum Wallboard
 - 2. ASTM C 79 Specification for Gypsum Sheathing - Paper faced (Glass mat faced, see ASTM C1177)
 - 3. ASTM C 473 Standard Test Methods for Physical Testing of Gypsum Panel Products
 - 4. ASTM C 475 Standard Spec for Joint Compound & Joint Tape for Finishing Gypsum Board
 - 5. ASTM C 518 Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - 6. ASTM C 840 Standard Spec for Application and Finishing of Gypsum Board
 - a. Comply with applicable requirements including recommendations of manufacturer, and comply with more stringent specifications as herein specified.
 - 7. ASTM C 931 Specification for Exterior Gypsum Soffit Board
 - 8. ASTM C 1177 Standard Spec for Glass Mat Gypsum Substrate for Use as Sheathing

9. ASTM C 1178 Standard Spec for Glass Mat Water-Resistant Gypsum Backing Panel
 10. ASTM C1396 Specification for Gypsum Board
 11. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
 12. ASTM E 72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
 13. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
- E. Gypsum Association (GA) www.gypsum.org
1. GA-214 Recommended Levels of Gypsum Board Finish
 2. GA-216 Specifications for the application and Finishing of Gypsum Board
 3. GA-220 Gypsum Board Winter Related Installation Recommendations
 4. GA-221 Repair of Gypsum Board Joint Ridging
 5. GA-223 Gypsum Panel Products Types, Uses, Sizes, And Standards
 6. GA-224 Installation of Predecorated Gypsum Board
 7. GA-225 Repair of Fire-Rated Gypsum Board Systems
 8. GA-226 Application of Gypsum Board To Form Curved Surfaces
 9. GA-229 Shear Values for Screw Application OF Gypsum Board On Walls
 10. GA-231 Assessing Water Damage to Gypsum Board
 11. GA-232 Painting New Gypsum Board
 12. GA-234 Control Joints For Fire-Resistant Rated Systems
 13. GA-235 Gypsum Board Typical Mechanical and Physical Properties
 14. GA-238 Guidelines for Prevention Of Mold Growth On Gypsum Board
 15. GA 253 Application Of Gypsum Sheathing
 16. GA-254 Fire-Resistant Gypsum Sheathing
 17. GA-276 Gypsum Board Roof Underlayment Systems
 18. GA-290 Gypsum Board Area Separation Walls
 19. GA-530 Design Data - Gypsum Board
 20. GA-600 Fire resistant Design Manual
 21. GA-605 Proprietary Gypsum Panels Products For Use In UL Classified Systems
 22. GA-610 Fire resistance Provided By Gypsum Board Membrane Protection
 23. GA-618 Building and Inspecting Smoke Barriers
 24. GA-620 Gypsum Area Separation Firewalls
 25. GA-801 Handling and Storage of Gypsum Panel Products
- F. International Code Council (ICC), www.iccsafe.org
- G. United States Gypsum (USG) www.usg.com
1. SA927 Application And Finishing Of Gypsum Panel Products
 2. SA923 Drywall/Steel Framed Systems
 3. SA924 Drywall/Wood Framed Systems
 4. SA925 USG Area Separation Fire Wall/Party Wall Systems
 5. SA926 USG Cavity Shaft Wall Systems
 6. SA933 "Sheetrock" Brand Textures and Finish Products
- H. Federation of Societies for Coating Technology (FSCT) www.coatingsocietiesinternational.org
1. Coatings Encyclopedic Dictionary
- I. Painting and Decorating Contractors of America (PDCA) www.pdca.org
1. Standard P1-92 Touch Up Painting and Damage Repair

2. Standard P4-94 Responsibility for Inspection and Acceptance of Surface Prior to Painting and Decorating
 3. Standard P5-94 Benchmark Sample Procedures for Paint and Other Coating System
 4. Glossary of Terms, Painting and Decorating Contractors of America, Fairfax, VA.
- J. Drywall Finishing Council Incorporated (DWFC) www.dwfc.org
1. Recommended Specification for Preparation of Gypsum Board Surfaces Prior to Texture Application.
 2. Interior Job Condition Specifications for the Application of Drywall Joint Compounds, Drywall Textures, and Paint/Coatings.
- K. National Evaluation Report (NER)
1. NER 458 Code Compliance for Exterior Ceiling Sheathing (Soffit sheathing)
 2. NER 258 USG Drywall Shaft Partition Systems

1.3 PERFORMANCE

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Gypsum Board / Sheathing & Sound Board	Flatness Tolerance	1/8" offsets between planes of board faces and 1/8" in 10 feet or plumb, level, warp and bow. Tolerance variation shall not be collective.	Gypsum Association
Gypsum Board / Sheathing	Recommended Levels of Gypsum Board Finish	Comply or as herein specified, whichever is more restrictive	GA-214-07 ANSI A98-7.1
	Application and Finishing of Gypsum Panel Products		GA-216-07
	Gypsum Board Winter Related Installation Recommendations		GA-220-06
	Repair of Gypsum Board Joint Ridging		GA-221-00
	Repairing Screw or nail Pops		GA-222-08
	Gypsum Panel Products Types, Uses, Sizes and Standards		GA-223-04
	Installation of Pre-decorated Gypsum Board		GA-224-08
	Repair of Fire-Rated Gypsum Board Systems		GA-225-08
	Application of Gypsum Board to Form Curved Surfaces		GA-226-08

	Shear Values for Screw Application of Gypsum Board on Walls		GA-229-08
	Assessing Water Damage to Gypsum Board		GA-231-06
	Painting New Gypsum Board		GA-232-04
	Control Joints for Fire-Resistance Rated Systems		GA-234-08
	Gypsum Board Typical Mechanical and Physical Properties		GA-235-05
	Joint Treatment Under Extreme Weather Conditions		GA-236-00
	Guidelines for Prevention of Mold Growth on Gypsum Board		GA-238-03
	Water-Resistant Gypsum Backing Board For Ceramic Tile in Wet Areas		GA-239-04
	Application of Gypsum Sheathing		GA-253-07
	Fire-Resistant Gypsum Sheathing		GA-254-07
	Gypsum Board Roof Underlayment Systems		GA-276-05
	Gypsum Board – Area Separation Walls		GA-290-02
	Fire Resistance Design Manual		GA-600-06
	Proprietary Gypsum Panel Products For Use in UL Classified Systems		GA-605-08
	Fire Resistance Provided by Gypsum Board Membrane Protection		GA-610-02
	Building and Inspecting Smoke Barriers		GA-618-04
	Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors		GA-801-07
Exterior Gypsum sheathing	Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber	10 minimum	ASTM D 3273
Exposed interior Gypsum Sheathing	Smooth Wall		
Smooth Wall / Level 5	Smooth Wall with Darby full surface float		
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. Definitions

1. Levels of gypsum board finish: (Typical)

- a. **Scope.** The required level of finish of gypsum board wall and the ceiling surfaces is described with typical applications and is listed as a minimum allowable standard. All proposed deviations from these herein specifications shall be in written form of a request and approved by the **Architect** prior to installation.

- b. **Terminology.** The following definitions are applicable to this document.

1. Accessories: Metal or plastic beads, trim or molding used to protect or conceal corners, edges or abutments of the gypsum board construction.
2. Back Roll: Rolling a spray painted surface with a paint roller immediately following spray application.
3. Coat: Paint, Varnish, or lacquer applied to a surface in a single application (one Layer) to form a properly distributed film when dry –ASTM

Note: Shall be applied as installed per Painting specification.

4. Critical (Severe) Lighting: A condition whereby interior surfaces are flooded by natural or artificial lighting at an oblique angle; such as lighting from large expanses of windows, glass curtain walls, skylights, or surface mounted light fixtures. Strong side lighting from windows or surface-mounted light fixtures. - ASTM

Note: See "comments" section of this document.

5. Drywall Primer: A paint material specifically formulated to fill the pores and minimize suction differences between gypsum board surfaces paper and the compound used on finished joints, angles, fastener heads, accessories, and over skim coating.

Note: this shall be applied as part of gypsum board specification

6. Gloss: A subjective term used to describe the relative amount and nature of mirror like (specular) reflection.

Note: FSCT

7. Joint Photographing (Telegraphing): The shadowing of the finished joint areas through the surface decoration and/or Smooth Wall

Note: Syn telegraphing. – GA-214-96

8. Paint: Any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate as a thin layer which is converted to an opaque solid film after application. Used for protection, decoration or identification or to serve some functional purpose, such as filling or concealing surface irregularities.

Note: FSCT, shall be applied as part of painting specification

9. Properly Painted Surfaces: A surfaces that is uniform in appearance, color and sheen. It is one that is free of foreign material, lumps skins, runs, sags, holidays, misses, strike-through, or insufficient coverage. It is a surface, which is free of drips, spatters, spills, or overspray, which were caused by the **General Contractor's** work force. Compliance to meeting the criteria of a "Properly painted surface" shall be determined when viewed without magnification at a distance of five feet or more under normal lighting conditions and form a normal viewing position.

Note: A surface uniform in appearance, color and sheen may not be achieved with a coat of primer or a single coat of topcoat. Shall be applied as part of Painting specification. – PDCA

10. Prime/Sealer: A gypsum board prime/sealer manufactured by company explicitly for priming gypsum board and formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories, and over skim coatings. See "comments" section of this document.

Note: Primer shall be provided by Gypsum board mfgr. and installed by gypsum board finisher in addition to "primer and finish paint as installed under separate specification Section 09 90 00."

11. Skim Coat: A thin coat of herein listed joint compound installed over the entire surface of the gypsum board to fill imperfections in the joint work, smooth the paper texture, and provide a uniform surface for a Smooth Wall appearance. Compound will be installed with Steel Trowel or Knife blade.

Note: Spray application is not allowed

12. Spotting: To cover fastener head with joint compound.
13. Texture: A decorative treatment of gypsum board surfaces.
14. Texturing: Regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with primer/sealer.

Note: Refer to Heading 2.05

15. Top Coat: The finish coat(s) of a coating system, formulated for appearance and or environmental resistance.

Note: shall be applied as part of painting specification – PDCA

16. Wall covering: Any type of paper, vinyl, fabric, or specialty material that is pasted onto a wall or ceiling in a wide array of colors, patterns, textures, and performance characteristics, such as washability and abrasion resistance.

Note: shall be applied as part of wall covering specification - FSCT

17. Wall covering Primer: Coatings formulated to seal the porosity of new drywall, joint compounds, and most surfaces. Also formulated to promote adhesion and serviceability under wall covering products.

Note: Shall be applied as part of wall covering specification.

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.
 - 1. Drywall products
 - 2. Joint tapes for Interior and Exterior applications
 - 3. Joint topping material
 - 4. Skim coat joint compound material – Smooth wall Level 5

- 5. Fasteners
- 6. Tools for product application
- 7. Texturing products
- E. Submit samples.
 - 1. Three (3) each 20" square portable mockups on gypsum board that include:
 - a. Finish taping, mud and primer
 - b. Butt joint treatment
 - c. Edge treatment
 - d. Specific required finishes
- F. Site mock up, refer to "Field Samples / Mock Up" heading.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.
- D. Lead Times:
 - 1. **General Contractor** shall coordinate with supplier to verify product lead times during bids and at award of contract, and account for such lead times in their costs and schedules.
 - 2. **General Contractor** shall provide an itemized list of materials which might have or are confirmed to have a lead time problem and what the anticipated lead time is.
 - 3. **General Contractor** shall certify in writing that all materials have acceptable lead times as they relate to availability for sub-contractor and **General Contractor** to meet construction schedule and sequence of construction.
 - 4. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid.
- E. Stipulations:
 - 1. At proprietary assemblies use specified and tested manufacturer and specific products, including but not limited to the gypsum board, fastening, etc.
- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 - 1. Agenda for meeting shall include, but not be limited to; review of Smooth wall, taping for various wall coverings and texture of wall.
 - 2. **General Contractor** shall request meeting 5 days in advance of construction.
- G. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation membrane waterproofing work to review installation procedures.
 - 1. Manufacturer's representative shall review and certify all phases of construction to verify the complete work meets specification requirements.

2. Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Comply with manufacturers recommendations

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
- B. Environmental:
 1. Interior: Do not install gypsum board, joint compounds, skim coats and textures if building temperature is below 55°F or if proper ventilation is not provided to eliminate excessive moisture from building.
 - a. Temperature shall be maintained after installation.
 2. Exterior: Do not install gypsum board, joint compounds, skim coats and textures if the exterior temperature is below 45°F.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to, the following:
 1. Wall Framing
 2. Electrical/Low Voltage Wiring & Devices
 3. Wall Finish for Mechanical Work
 4. Wall coverings
 5. Rated wall penetrations
 6. Acoustical wall assemblies and penetrations
- B. Related Sections include, but are not limited to, the following:
 1. Division 1
 2. Section 09 90 00 – Paints and Coatings

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 - 1. Gypsum sheathing (Interior):
 - a. Typical and as indicated:
 - 1) Georgia Pacific (GP), www.gp.com
 - 2) U.S Gypsum (USG), www.usg.com
 - 3) National Gypsum, Gold Bond www.national-gypsum.com
 - b. Where indicated:
 - 1) U.S Gypsum (USG), www.usg.com
 - c. Alternates where allowed:
 - 1) National Gypsum, Gold Bond & GridMarx, www.national-gypsum.com
 - 2) Pabco Gypsum, www.pabco gypsum.com
 - 2. Gypsum sheathing (Exterior):
 - a. Typical and as indicated:
 - 1) Georgia Pacific (GP), www.gp.com
 - 2) U.S Gypsum (USG), www.usg.com
 - 3) National Gypsum, Gold Bond www.national-gypsum.com
 - b. Where indicated:
 - 1) National Gypsum, Gold Bond, www.national-gypsum.com
 - 3. Sound Deadening sheathing (Interior):
 - a. Homasote – Typical www.homasote.com
 - 4. Joint treatment & finishing (Interior & Exterior)
 - a. U.S Gypsum (USG), www.usg.com
 - b. National Gypsum, Gold Bond www.national-gypsum.com
 - c. Georgia Pacific (GP), www.gp.com

- d. Bead-Ex www.usg.com
- e. Hamilton www.hamiltonnw.com
- 5. Accessories:
 - a. U.S Gypsum (USG), www.usg.com
 - b. National Gypsum, Gold Bond & GridMarx, www.national-gypsum.com
 - c. Superior Metal Trim www.superiormetaltrim.com
 - d. Flannery, Inc., 818 837-7585, www.flannerytrim.com
 - e. Fry Reglet www.fryreglet.com
 - f. MILGO/BUFKIN, www.milgo-bufkin.com
- 6. Reveals/End Caps:
 - a. Flannery, Inc., 818 837-7585, www.flannerytrim.com
 - b. Superior Metal Trim www.superiormetaltrim.com
 - c. Fry Reglet www.fryreglet.com
 - d. MILGO/BUFKIN, www.milgo-bufkin.com
 - e. Liquid applied waterproof membrane – Laticrete, www.Laticrete.com
- 7. Sealants:
 - a. Pecora, www.pecora.com
 - b. Refer also to Sealant Specification Section 07 92 00.
- 8. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. General

- 1. Conform to American National Standards Institute Specifications and Gypsum Association for Gypsum Wallboard finishes.
- 2. Sheathing type as herein specified and in accordance with manufacturer's recommendations.
- 3. Wall board shall be fire-rated typical, Type "X" typical, U.N.O. and comply with specified and detailed wall construction types.

B. Wallboard & Ceiling Board Sheathing

1. **INTERIOR SCHEDULE:**

a. General:

- 1) Type X Core, Fire Code C and/or Type XXX regarding if application is a rated assembly
- b. Interior walls, U.N.O.:

- 1) Mfgr:
 - a) Typical: Georgia Pacific
 - b) Alternate 1: US Gypsum
 - c) Alternate 2: Pabco
 - d) Alternate 3: Nation Gypsum, Gold Bond
 - 2) Brand:
 - a) Typical: ToughRock® Fireguard Type X
 - b) Alternate 1: Sheetrock
 - c) Alternate 2: Flame Curb
 - d) Alternate 3: Fire Shield
 - 3) Product:
 - a) Typical: Type "X" Core
 - b) Alternate 1: Firecode "C" Core (if specific to approved design)
 - c) Alternate 2: Type XXX
 - 4) Size:
 - a) Thickness:
 - i. 5/8" typical
 - ii. 1/2" as indicated per plan details
 - b) Width x Length: 4'-0" wide x 8', 9', 10', 12' or 14' (size to minimize quantity of joints)
 - 5) Material: Paper faced gypsum core board
 - 6) Edge: Tapered
 - 7) Standard: ASTM C36
 - 8) Finish: As herein specified and indicated in drawings
 - 9) Limitations:
 - a) See body of this specification for specific product types for specific conditions.
 - b) At interior face of Exterior walls use Dens Armour Plus Fireguard, High Performance Interior Panel as herein specified unless herein in indicated otherwise or an herein approved alternate.
- c. Interior Face of Exterior Walls:
- 1) Application: Wall Sheathing
 - a) Full height from floor to underside of roof decking.
 - b) Exposed and concealed conditions
 - 2) Schedule: Full Height
 - a) Material:
 - i. Schedule:
 - a. Mfgr: Georgia Pacific
 - b. Product: Dens Armour Plus® Fireguard® Type X, High Performance Interior Panel
 - c. Size: 5/8"x 4'-0"x 8' & 10'(size to minimize quantity of joints)
 - d. Material: Gypsum sheathing with inorganic coated glass fiber mats on each face

- e. Edge: Tapered
- f. Rating: Type "X"

b) Limitations:

- i. Do not use at the following locations requiring other sheathing as herein specified under the 'Wallboard & Ceiling Board for Interior conditions.'
 - a. Curved walls – Specialty board - Non rated:
 - b. Curved walls – Non rated:
 - c. Shaft wall sheathing:
 - d. Abuse-resistant Impact locations – Moderate Duty:
 - e. Abuse-resistant Impact locations – Heavy Duty:
 - f. Wet locations – Showers:
 - g. Shaft wall sheathing:
 - h. Veneer wall and ceiling – non shower locations
 - i. Cement Plaster substrate:
 - j. Fully adhered Natural Stone substrate
 - k. Sound Damping Wall board:
 - l. Sound Damping Ceiling board:
 - m. Modular Brick Substrate

- 3) Finish: As herein specified and indicated in drawings including skim coat over entire surface prior to finishing.

d. Cement Plaster substrate:

- 1) Application: Substrate for Cement Plaster assembly
- 2) Schedule:

a) Option 1:

- i. Mfgr: Georgia Pacific
- ii. Product: Dens Glass™ Fireguard® Type X Exterior Sheathing
(formerly Dens Glass Gold)
- iii. Size: 5/8" x 4'-0" wide x 8', 9' and 10' (minimize quantity of joints)
- iv. Material:
 - a. Face: Glass mat sides – gold color
- v. Edge: Square
- vi. Rating:
 - a. Designation: Type "X"
 - b. Flame spread: 0
 - c. Smoke developed: 10 or less
- vii. Warranty:
 - a. Weather exposure: 12 months
 - b. Mfgr. defects: 5 years
 - c. Joints: Self adhering fiberglass mesh tape and approved tapping compound

b) Option 2:

- i. Mfgr: National Gypsum

- ii. Brand: Gold Bond®
- iii. Product: eXP (formally e²XP) Fire Shield® Extended Exposure Sheathing
- iv. Size: 5/8" x 4'-0" wide x 8', 9' & 12' (size to minimize quantity of joints)
- v. Material:
 - a. Faces: Coated Fiberglass Mat
 - b. Color: Purple
- vi. Edge: Square
- vii. Rating:
 - a. Designation: Type "X"
 - b. Flame spread: 0
 - c. Smoke developed: 10 or less
- viii. Warranty:
 - a. Weather exposure: 12 months
 - b. Mfgr. defects: 5 years
- ix. Joints: Self adhering fiberglass mesh tape and approved tapping compound

c) Option 3:

- i. Mfgr: USG
- ii. Product: Securock® Glass-Mat Sheathing
- iii. Size: 5/8" x 4'-0" wide x 8', 9' & 12' (size to minimize quantity of joints)
- iv. Material:
 - a. Faces: Coated Fiberglass Mat
 - b. Color: Lime Green
- v. Edge: Square
- vi. Rating:
 - a. Designation: Type "X"
 - b. Flame spread: 0
 - c. Smoke developed: 10 or less
- vii. Warranty:
 - a. Weather exposure: 12 months
 - b. Mfgr. defects: 5 years
- viii. Joints: Self adhering fiberglass mesh tape and approved tapping compound

3) Finish: Level 4

2. **EXTERIOR SCHEDULE:**

a. Walls

1) Exterior sheathing schedule:

a) General, U.N.O.

- i. Option 1:
 - a. Mfgr: Georgia Pacific
 - b. Product: Dens Glass™ Fireguard® Type X Exterior Sheathing

- (formerly Dens Glass Gold)
- c. Size: 5/8" x 4'-0" wide x 8', 9' and 10' (minimize quantity of joints)
 - d. Material:
 - i). Face: Glass mat sides – gold color
 - ii). Edge: Square
 - e. Rating:
 - i). Designation: Type "X"
 - ii). Flame spread: 0
 - iii). Smoke developed: 10 or less
 - f. Warranty:
 - i). Weather exposure: 12 months
 - ii). Mfgr. defects: 5 years
 - g. Joints: Self adhering fiberglass mesh tape and approved tapping compound
- ii. Option 2:
- a. Mfgr: National Gypsum
 - b. Brand: Gold Bond®
 - c. Product: eXP (formerly e²XP) Fire Shield® Extended Exposure Sheathing
 - d. Size: 5/8" x 4'-0" wide x 8', 9' & 12' (size to minimize quantity of joints)
 - e. Material:
 - i). Faces: Coated Fiberglass Mat
 - ii). Color: Purple
 - f. Edge: Square
 - g. Rating:
 - i). Designation: Type "X"
 - ii). Flame spread: 0
 - iii). Smoke developed: 10 or less
 - h. Warranty:
 - i). Weather exposure: 12 months
 - ii). Mfgr. defects: 5 years
 - i. Joints: Self adhering fiberglass mesh tape and approved tapping compound
- iii. Option 3:
- a. Mfgr: USG
 - b. Product: Securock® Glass-Mat Sheathing
 - c. Size: 5/8" x 4'-0" wide x 8', 9' & 12' (size to minimize quantity of joints)
 - d. Material:
 - i). Faces: Coated Fiberglass Mat
 - ii). Color: Lime Green

- e. Edge: Square
 - f. Rating:
 - i). Designation: Type "X"
 - ii). Flame spread: 0
 - iii). Smoke developed: 10 or less
 - g. Warranty:
 - i). Weather exposure: 12 months
 - ii). Mfgr. defects: 5 years
 - h. Joints: Self adhering fiberglass mesh tape and approved tapping compound
 - iv. Interior exposed face of exterior walls:
 - a. Refer to heading in INTERIOR SCHEDULE portion as herein specified.
- b) Cement Plaster substrate:
- i. Option 1:
 - a. Mfgr: Georgia Pacific
 - b. Product: Dens Glass™ Fireguard® Type X Exterior Sheathing (formerly Dens Glass Gold)
 - c. Size: 5/8" x 4'-0" wide x 8', 9' and 10' (minimize quantity of joints)
 - d. Material:
 - i). Face: Glass mat sides – gold color
 - e. Edge: Square
 - f. Rating:
 - i). Designation: Type "X"
 - ii). Flame spread: 0
 - iii). Smoke developed: 10 or less
 - g. Warranty:
 - i). Weather exposure: 12 months
 - ii). Mfgr. defects: 5 years
 - h. Joints: Self adhering fiberglass mesh tape and approved tapping compound
 - ii. Option 2:
 - a. Mfgr: National Gypsum
 - b. Brand: Gold Bond®
 - c. Product: eXP (formerly e²XP) Fire Shield® Extended Exposure Sheathing
 - d. Size: 5/8" x 4'-0" wide x 8', 9' & 12' (size to minimize quantity of joints)
 - e. Material:
 - i). Faces: Coated Fiberglass Mat
 - ii). Color: Purple
 - f. Edge: Square
 - g. Rating:

- i). Designation: Type "X"
 - ii). Flame spread: 0
 - iii). Smoke developed: 10 or less
 - h. Warranty:
 - i). Weather exposure: 12 months
 - ii). Mfgr. defects: 5 years
 - i. Joints: Self adhering fiberglass mesh tape and approved tapping compound
- iii. Option 3:
 - a. Mfgr: USG
 - b. Product: Securock® Glass-Mat Sheathing
 - c. Size: 5/8" x 4'-0" wide x 8', 9' & 12' (size to minimize quantity of joints)
 - d. Material:
 - i). Faces: Coated Fiberglass Mat
 - ii). Color: Lime Green
 - e. Edge: Square
 - f. Rating:
 - i). Designation: Type "X"
 - ii). Flame spread: 0
 - iii). Smoke developed: 10 or less
 - g. Warranty:
 - i). Weather exposure: 12 months
 - ii). Mfgr. defects: 5 years
 - h. Joints: Self adhering fiberglass mesh tape and approved tapping compound
- c) Ceilings (Exposed application):
 - i. Mfgr: USG
 - ii. Product: Sheetrock Brand – Exterior Gypsum Ceiling Board
 - iii. Size: 5/8" x 4'-0" wide x 8'-0" and 12'-0" (minimize quantity of joints)
 - iv. Material: Beige color, water-repellant face paper
 - v. Edge: SW Tapered
 - vi. Rating: Firecode
 - vii. Testing: Flame Spread = 20, Smoke Developed = 0
 - viii. Limitations: Maximum framing at 12" o.c.

2.3 OTHER MATERIALS

- A. Accessories: Trim accessories, including, but not limited to:
 - 1. Joint treatment: Refer to Heading 2.04
 - 2. Outside edge:
 - a. Mfgr: USG
 - b. Product: DUR-A-BEAD Corner Bead
 - c. Material: Standard galvanized steel units
 - d. Model: No.103 1-1/4" x 1-1/4"

3. Inside corner:

- a. Mfgr: USG
- b. Product: Sheetrock Brand
- c. Material: Paper Faced Metal Trim x 90-degree angle
- d. Model: Tape on Trim No. B2

4. Offset Inside corner:

- a. Mfgr: USG
- b. Product: Sheetrock Brand
- c. Material: Paper Faced Metal Trim x greater than 90 degree angle
- d. Model: B2 OS

5. "Z" shape trim for edge of board at step back reveal:

- a. Mfgr: USG
- b. Product: Sheetrock Brand
- c. Material: Paper Faced Metal Trim Tape on trim x "Z" profile
- d. Model: B4 NB

6. "L" shape trim for edge of board at Acoustical tile ceiling:

- a. Mfgr: USG
- b. Product: Sheetrock Brand
- c. Material: Galvanized Metal Trim x "L" shape 90-degree angle
- d. Model: No. 200 – B x 1/2" and/or 5/8"

7. "J" shape trim for edge of board, typical:

- a. Mfgr: USG
- b. Product: Sheetrock Brand
- c. Material: Galvanized Metal Trim
- d. Model: No. 200 – A x 1/2" and/or 5/8"

8. Control Joint:

- a. Mfgr: USG
- b. Product: Sheetrock Brand
- c. Material: Zinc
- d. Model: No. 093
- e. Profile: 1/4" opening x 7/16" depth x 10'-0" length

B. Substrate Fasteners

1. Nails (Wood framing)

- a. Size (1-1/2") (1-3/4")

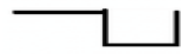
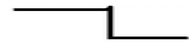
- 1) 11-gauge, hot-dipped galvanized roofing nails with nominal 7/16" diameter head for wood framing.

2. Screws: (Metal stud framing)

- a. 1" Type S-12 Bugle Head Corrosion-Resistant Screws for application of sheathing to steel studs.
- b. 1-1/4" Type S-12 Pancake Head Corrosion-Resistant Screws for application of self-furring metal lath or brick ties through sheathing to steel studs.

C. Reveals – Not Used

1. Mfgr: Fry Reglet (FR)
 - a. Alternate: Flannery Trim (FT), www.flannerytrim.com
2. Product:
 - a. Schedule:

Type	Model	Size	Application
Drywall Reveal 	DRM 625-100 (FR) DWR 625-100 (FT)	5/8" deep x 1" wide	Field Reveal with gyp. Bd. Each side
Drywall "F" Reveal Mold 	DRMF 625-100 (FR) DWRF 625-100 (FT)	5/8" deep x 1" wide	Edge Reveal with gyp. Bd. one side and butt on other side with return reveal lip
Drywall "Z" Reveal Mold 	DWSM 625-100 (FT) DRMZ 625-100 (FR)	5/8" deep x 1" wide	Edge trim with gyp. Bd. one side and butt on other side without return reveal lip

3. Finish: Mill finish aluminum, painted.
4. Accessories: Alignment splices

D. Joint Treatment and Skim Coat Treatment - Interior

1. Schedule:
 - a. Applications:
 - 1) Typical, interior dry conditions, U.N.O
 - a) Type:
 - i. Drying: water evaporation type unless application is;
 - a. In cold weather
 - a. Required to be Setting Compound by type of tape such as mesh fiberglass
 - b. Required by application
 - c. Required by sheathing mfgr.
 - b) Mfgr: USG
 - c) Brand: Sheetrock
 - d) Tape Product: Joint Tape – Heavy
 - e) Treatment Compound:
 - i. Product:
 - a. Initial installation of tape:
 - i). Product: Taping Compound
 - b. Secondary and final finishing compound:
 - i). Product: Topping Compound or Plus Three Compound
 - c. Skim Coat:

i). Product: Plus Three Compound

2) Interior Face of All Exterior Walls:

- a) Substrate: Dens Armour Plus
 - i. Mfgr: Georgia Pacific
- b) Tape Product: Self adhering 10x10 x 2" wide woven glass mesh tape over all joints, inside corners and outside corners
 - i. Mfgr: Georgia Pacific
 - ii. Model: ToughRock, Fiberglass mesh tape
- c) Treatment Compound:
 - i. Mfgr: USG
 - ii. Type: Setting Compound (chemical hardening)
 - iii. Product:
 - iv. Installation: Per manufacturers recommendations
 - v. Finish: Level 5
 - a. Includes as herein specified with the entire surface of sheathing skim coated.

E. Joint Treatment and Skim Coat Treatment – Exterior walls

1. Schedule:

a. Typical conditions

1) Option 1:

- a) Application: Underlayment for wall finishes
 - i. Substrate: Dens Glass™ Fireguard® Type X Exterior Sheathing
 - a. Mfgr: Georgia Pacific
 - ii. Tape Product: Self adhering 10x10 x 2" wide woven glass mesh tape over all joints, inside corners and outside corners
 - a. Mfgr: Georgia Pacific
 - b. Model: ToughRock, Fiberglass mesh tape
 - iii. Treatment Compound:
 - a. Mfgr: Pecora
 - b. Type: Latex Sealant
 - c. Product: AC-20 Acrylic Latex sealant
 - d. Installation: Per manufacturers recommendations
 - iv. Fastener treatment: Refer to INSTALLATION heading

2) Options:

- a) Application: Underlayment for wall finishes
 - i. As herein approved

F. Joint Treatment and Skim Coat Treatment – Exterior Ceilings

1. Schedule:

a. Exposed ceiling board

- 1) Mfgr: USG
- 2) Products: Refer to matrix:
- 3) Matrix of materials and Level of finish:

	Primer – Oil Base	Setting-Type Joint Compounds (Sheetrock Brand) Joint Prefill, Joint Taping, Fill Coat and Finish Coats		
	First Coat	Taping	Durabond®	Easy Sand™
Level 4				
Embedding		■	■	
Fill Coats		■	■	
Finish			■	■
Primer	■			

G. Wall finish, Texture Products and Schedule – Interior & Exterior

1. General: Comply with USG Design Guidelines SA923
2. Finish Schedule:

a. Finish Texture:

1) Standard Texture:

- a) Mfgr: USG
- b) Texture designation:
 - i. Textured walls: Fine Orange Peel
 - ii. Smooth Wall Level Five: No texture
- c) Schedule: At all walls and ceilings, U.N.O
- d) Product Schedule:
 - i. Sealer / Primer:
 - a. Material: Gypsum board sealer/primer
 - b. Product: First Coat, Sheetrock brand
 - c. Application: Spray applied over entire surface Material
 - ii. Texture:
 - a. Material: Red Bag Wall Texture
 - b. Application: Spray applied
 - a. Coverage: Apply at rate of 20-40 pounds per square foot

PART 3 - **EXECUTION**

3.1 INSPECTION/EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.

2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 MOCK-UP

- A. Erect at location approved by **Architect**.
 1. Mock-up shall be part of final construction once approved by **Architect**.
 2. Mock-up shall comprise of all components and finishes as specified and indicated in Drawings.
 - a. Texture
 - b. Level 5 finish
- B. Mock-up
 1. Size: 6' x 6'
 2. Qty: One (1) each for each wall surface condition and finish

3.5 INSTALLATION

- A. General:
 1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 2. Perform work in accordance with herein listed standards.
 3. Install with fiberglass tape at gypsum board requiring it as herein specified and required by mfgr.
- B. Sheet arrangement layout: Conform to layouts and requirements indicated; use long sheets to restrict joints to minimum.
 1. Edges of sheathing shall not align with the vertical and/or horizontal edges of window and/or door openings.
- C. Interior Joints:
 1. Perform work in accordance with gypsum board mfgr's requirements and to meet smooth wall and/or textured wall surface
 2. Perform work in accordance with gypsum board mfgr's requirements and in accordance with wall veneer including, but not limited to;
 - a. Tile
 - b. Stone

D. Exterior Joints:

1. General: Gypsum sheathing:

- a. Butt sheets loosely together with tapered edges always placed together. Sand or kerf cut edges and mill ends to provide smooth jointing on exposed face.

- 1) Stagger end joints.

2. Schedule: Dens Glass™ Fireguard® Type X Exterior Sheathing or approved option as herein approved:

a. General:

- 1) Install in accordance with sheathing manufacturers recommendations and as herein specified.

- 4) The surface of framing and furring members to receive sheathing should not vary more than 1/4" from the plane of faces of adjacent members.

- a) Make appropriate modifications and/or coordinate with **General Contractor** to meet out of plane criteria.

- 5) End joints, if required, should be offset; joints should fit snugly and flashing installed around all openings.

- a) Except vertical joints at expansion conditions.

- 6) Panels of the maximum lengths possible should be used to minimize the number of joints.'

- a) Edge joints must be located parallel to and with vertical orientations on framing.

- b) End joints of adjacent lengths of sheathing must be staggered.

- c) Except at expansion joints.

- 7) Wood Framing: Sheathing must be attached to wood framing with nails spaced 4" o.c. at perimeter for racking shear resistance, 8" o.c. at perimeter where racking shear resistance is not required, and 8" o.c. along intermediate framing.

- 8) Metal Framing: Sheathing must be attached to metal framing with screws spaced 8" o.c. at perimeter and 8" o.c. along intermediate framing.

- 9) Fasteners must be driven so as to bear tight against and flush with surface of sheathing.

- a) Fasteners must NOT be countersunk.

- 10) Fasteners must be located a minimum of 3/8" from edges and ends of sheathing panels unless approved otherwise by sheathing mfr.

- 11) Where sheathing is used in applications involving veneer systems, any joint treatment required should be in accordance with sheathing manufacturer's instructions and requirements of local governing authorities.

- 12) Where sheathing is used in applications of painted ceilings and soffits, joint tape must be applied over joints and embedded in a specified setting type joint compound.

- a) For smooth finish, the surface should be skim coated with joint compound.

b. Joint treatment:

- 1) Schedule:

- a) Typical: (1/8" – 3/8" maximum width)

- i. 1st: Apply glass mesh joint tape to all joints, overlapping at intersections by the width of the tape.
 - ii. 2nd: Apply approximately a 3/8" bead of caulk along the joint.
 - iii. 3rd: Embed the caulk into the entire surface of the tape with a trowel.
 - a. Use backer rod for openings larger than 1/8"
 - b) Expansion Joints:
 - i. Hold edges of sheathing 3/8" apart.
 - ii. Install backer rod and sealant at the top of joint 6" long and at the bottom of the joint 6" long to ensure no gaps into wall cavity or joint.
 - iii. Install manufacturer approved primer along length of joint wide enough to extend 2" past the continuous strip of cold applied self-adhering membrane applied evenly spaced over joint and edge fasteners.
 - c. Fastener Treatment
 - 1) Schedule:
 - a) Typical – except for expansion joints
 - i. Install manufacturer approved sealant over each fastener head and trowel smooth.
 - ii. Sealant shall be compatible with sheet applied and/or liquid applied vapor barriers and/or waterproof membranes.
 - 3. Ceiling Board Exterior gypsum sheathing:
 - a. Pre-fill joints with Setting-Type Joint compound.
 - b. Embed Joint Tape in Joint compound.
 - c. Install Joint compound over zinc, metal trims and beads.
 - d. Install Joint compound over all fastener heads.
 - e. Apply finish coats of Setting-Type Joint compound.
 - f. Skim coat as herein specified for shower ceilings without tile veneer finish.
 - g. Apply Primer –Sealer prior to texturing.
 - h. Apply texture
 - i. Finish paint
- E. Typical:
- 1. Fasteners:
 - a. Place fasteners 3/8 inch from edges of boards, except when using washers or clips with fasteners in joint.
 - b. Install fasteners with heads dimpled slightly below surface; do not cut through skin.
 - c. Space fasteners in accordance with ASTM C840 and manufacturer's recommendations, except as otherwise required by CBC.
 - d. Install type of fastener and length in accordance with sheathing manufacturer.
 - e. All ends and edges of all gypsum wallboard shall occur over framing members, except when joints are at right angles to framing members.
 - 2. Ceilings:
 - a. General:
 - 1. Place boards with long dimension at right angles to supports and end joints occurring over supports.

2. Place perimeters of ceilings and edges of openings over solid bearing members.
 - b. Maximum joist spacing shall not exceed 12" O.C.
3. Partitions: Place boards with long dimension either vertical or horizontal (but not combination of both) on studs. Stagger joints on opposite sides of partitions. Locate joints at least 12 inches from jambs of openings. Keep end joints to minimum. Fasten double layer gypsum board as required by code, stagger joints in second layer.
4. Caulking: Using double bead of specified material, install at floors, wall intersections, where walls abut other materials and at all electrical boxes. Install wherever caulking materials is indicated in connection with gypsum board. Apply in accordance with manufacturer's printed directions.
5. Cutting and scribing: Cut neatly to fit around outlets, switch boxes and other protrusions, using keyhole saw or specially designed cutting tool for opening of exact shape and size needed.
6. Trim: Edge exterior corners with bead set to true, plumb line. Where gypsum board joins or abuts any material other than gypsum board, cover end of board with metal casing, leaving joint sufficient for installation of caulking (refer to Article 3.03 F above).

F. Reveals

1. The **General Contractor** shall furnish all labor, materials, services and equipment necessary for, and reasonably incidental to the installation of the reveals as indicated on the contract documents and as herein specified.
 - a. Reveals shall be installed with full length pieces and butt joints shall only occur at end conditions.
 - b. Install with concealed mechanical fasteners.
 - c. Install with prefabricated intersections.

G. Finishing

1. Matrix: Joint treatment and Skim coat treatment:
 - a. USG matrix of materials and level of finish
 - 1) For other products indicated, match that manufacturer's installation recommendations.

		Ready-Mixed Joint Compounds				Drying-Type Joint Compounds				Setting-Type Joint Compounds	
	First Coat	Taping	Topping	All-Purpose	Plus 3	Taping	Topping	All-Purpose	AP Lite	Durabond®	Easy Sand™
Level 0											
Not Used											
Level 1											
Embedding		■		■	■	■		■	■	■	■
Level 2											
Embedding		■		■	■	■		■	■	■	■
Fill			■	■	■		■	■	■	■	■
Level 3											
Embedding		■		■	■	■		■	■	■	■

Fill			■	■	■		■	■	■	■	■
Primer	■										
Level 4											
Embedding		■		■	■	■		■	■	■	■
Fill			■	■	■		■	■	■	■	■
Finish			■	■	■		■	■	■	■	■
Primer	■										
Level 5											
Embedding		■		■	■	■		■	■	■	■
Fill			■	■	■		■	■	■	■	■
Finish			■	■	■		■	■	■	■	■
Skim/Darby				■	■						
Primer	■										

2. Levels Schedule

- a. **Levels of Finish.** The following levels of finish are established as a guide for specific final decoration and/or Smooth Wall finish and are a minimum standard for each condition.

1) Level 0:

- a) Not Used

1) Level 1:

- a) Schedule:

- i. Plenum areas above ceilings, in attics, in areas where the assembly including, but not limited to;
 - a. Joints
 - b. Fastener heads
 - c. Around all wall penetrations
- ii. All joints, exterior angles, reveals and interior angles shall have tape embedded in joint compound.
 - a. Surface shall be free of excess joint compound.
 - b. Tool marks and ridges are acceptable.

2) Level 2:

- a) Schedule:

- i. Use where water resistant tile backing board is used as a substrate for tile.
- ii. All joints, fasteners, exterior angles, reveals and interior angles shall have fiberglass mesh tape embedded in joint compound and one additional 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.

- iii. Primer/Sealer: yes, entire gypsum board surface including treated joints, exterior angles, interior angles, reveals, fasteners, etc. shall be coated with a primer/sealer prior to the application of final finishes.
- iv. Gypsum board primer/sealer must be applied as a requirement of this specification section in addition to any and all requirements of primer and paint specified and installed under Section 09 90 00 – Painting and Coatings.

3) **Level 3:**

- a) Schedule:
 - i. Use at conditions where a material will be adhesively applied to gypsum board.
 - ii. Texture: None
 - iii. Applications:
 - a. Where indicated in drawings
 - b. Vinyl Wall Covering at Classrooms
- b) Application:
 - i. All joints and angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and angles.
 - a. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
 - ii. All fasteners heads and accessories shall be covered with a coat of joint compound and wiped with a joint knife leaving a thin coating of joint compound.
 - iii. Surface shall be free of excess compound.
 - iv. Tool marks and ridges are acceptable.
 - v. Primer/Sealer: yes, entire gypsum board surface including treated joints, exterior angles, interior angles, reveals, fasteners, etc. shall be coated with a primer/sealer prior to the application of final finishes.
 - a. Gypsum board primer/sealer must be applied as a requirement of this specification section in addition to any and all requirements of primer and paint specified and installed under Section 09 90 00 – Painting and coatings.

4) **Level 4:**

- a) Schedule:
 - i. Use at all conditions unless noted and/or specified to be Smooth Wall, Level 5 as specified herein, refer to "Level 5 (Smooth Wall) heading and Drawings.
 - ii. Texture; refer to Heading 2.05 for required texture.
- b) Application:
 - i. All joints, fasteners, exterior angles, reveals and interior angles shall have tape embedded in joint compound and **three** separate coats of joint compound applied over all joints, fasteners, angles, fastener heads, and accessories. All joint compounds shall be smooth and free of tool marks and ridges. Refer to Heading 2.04 for schedule of specific products.
 - a. Taping Compound width schedule:

- ii). First coat: 8" wide
 - iii). Second coat: 10" wide
 - iv). Third coat: 12" wide
- b. Primer/Sealer: yes, entire gypsum board surface including treated joints, exterior angles, interior angles, reveals, fasteners, etc. shall be coated with a primer/sealer prior to the application of final finishes.
 - i). Gypsum board primer/sealer must be applied as a requirement of this specification section in addition to any and all requirements of primer and paint specified and installed under Section 09 90 00 – Painting and Coatings.
- c) Limitations:
 - i. At un-backed vinyl wall covering apply a Level 5 finish to wall substrate

3.6 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END SECTION 09 29 00

SECTION 09 30 00 – TILE AND STONE

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Interior floor and wall applications with the following requirements as herein specified and as indicated on Documents, including but not limited to:
 - a. Liquid applied Waterproof and Crack protection floor and base assembly
 - b. Shower room waterproof floor, base, wall and ceiling assembly
 - 2. Grouts
 - 3. Tile and Grout Sealers
 - 4. Adhesives and Sealants
 - 5. Transitions and Accessories

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Iron and Steel Institute (AISI) www.steel.org
 - 1. Specification for the Design of Cold Formed Steel Structural Members
- E. American Society for Testing and Materials (ASTM) www.astm.org
 - 1. ASTM A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
 - 2. ASTM A185 Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - 3. ASTM C144 Standard Specification for Aggregate for Masonry Mortar
 - 4. ASTM C150 Standard Specification for Portland Cement

5. ASTM C157 Standard Test Method for Length Change of Hardened Cement Mortar and Concrete
 6. ASTM C270 Standard Specification for Mortar for Unit Masonry
 7. ASTM C482 Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste
 8. ASTM C627 Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
 9. ASTM C794 Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
 10. ASTM C847 Standard Specification for Metal Lath
 11. ASTM C920 Standard Specification for Elastomeric Joint Sealants
 12. ASTM C1028 Evaluating the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull Method.
 13. ASTM D751 Standard Test Method for Coated Fabrics
 14. ASTM D4068 Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane
 15. ASTM D4263 Standard Test Method for Determining Moisture in Concrete by the Plastic Sheet Method
 16. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
 17. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials
 18. ASTM E154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
 19. ASTM E1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
 20. ASTM F1249 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
- F. American Society of Mechanical Engineers (ASME) www.asme.org
1. ASME A112.6.3 Floor and Trench Drains
- G. American National Standards Institute (ANSI) www.ansi.org
1. ANSI A108/A118/A136.1 American National Specifications for the Installation of Ceramic Tile
- H. Tile Council of North America (TCNA), www.tcnatile.com
1. Handbook for Ceramic, Glass and Stone Tile Installation
- I. Materials and Methods Standards Association (MMSA), www.mmsa.usa
1. MMSA Bulletins 1 – 16
- J. International Organization for Standardization (ISO), www.iso.org
1. ISO 13007 Ceramic Tiles Grouts and Adhesives
 2. ISO/TS 11665 Measurement of Radioactivity within the Environment (Radon)

K. European Committee for Standardization (CEN), www.cencenelec.eu/european-standardization/european-standards/

1. EN 12004 Adhesives for Ceramic Tiles Test Methods
2. EN 13888 Grouts for Ceramic Tiles Test Methods

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Job site inspections shall be done as herein specified and as listed in drawings.
3. Testing shall be done as herein specified and as listed in drawings.
4. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

1. General:

Item	Name of Test	Performance	Testing Std.
Subsurface	Subsurface level tolerance, typical	1/8" in 10'-0" non-cumulative	ANSI standards
		1/16" in 1'-0" non-cumulative	
	Subsurface level tolerance between adjoining edges of same or dissimilar materials	1/32" max	
	Moisture level	Dry	ASTM D4263 and Section 07260
Flooring Installation	Slip Resistance Coefficient of Friction	0.6 min level to 5%	ASTM C 1028
	Slip Resistance Coefficient of Friction	0.8 min greater than 5%	
Movement Joints	Locations	Interior: not to exceed 24'-0" to 36'-0" in each direction over floor.	TCNA EJ171-07
Floor and Wall Finishes	Interior Surface Finishes	Materials shall be smooth, hard, non-absorptive material within boundaries indicated in building code and as revised to be more inclusive as indicated in contract documents.	CBC 1210.2
Wall to floor transition	Type	3/8" min. radius cover of smooth, hard, non-absorptive material.	Health dept. having jurisdiction
Refer to drawings and as herein specified			

2. **Wall and Ceiling Sheathing**

- a. Refer to Section 09 29 00 - Gypsum Board & Sheathing Substrates.

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. Construction Testing:

Item	Name of Test	Performance Results	Testing Std.
Sealers	Appearance of substrate not altered	Mockup on samples of tile shall be provided with submittal for visual approval by Architect prior to installation of tile.	

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Submit product information, samples, and shop drawings in one complete submittal package:
 1. Manufacturer Product & Technical Data for all assembly components.
 2. Manufacturer MSDS Sheets
 3. Manufacturer Installation Instructions
 4. Manufacturer and Contractor Warranties
 5. Manufacturer Certifications
 6. Product Samples:
 - a. Provide three (3) of each type, color, size, and finish included in the work, noted with designation herein, and noted in the drawings, including:
 - 1) Full size tile and trim shapes (without sealer)
 - a) Where tile has color or pattern variation, provide samples which represent the full potential range of variation.
 - 2) Grout color samples
 - 3) Sealant color samples
 - 4) Prefabricated joints / transitions
 - b. Provide one (1) additional tile sample of each type, color, size, and finish included in the work, noted with designation herein, and noted in the drawings with sealer applied to the tile sample.
 7. Shop drawings:
 - a. Submit drawings (plans, elevations) showing location for each type of tile and clearly indicating pattern, color, expansion joints, soft joints (sealant), and tile start points.
 - 1) **Contractor** shall use as a guide the TCNA Manual, drawings and specifications, most current editions for expansion and sealant joint locations.

8. Mock-Ups:

- a. Erect at locations approved by **Architect**.
 - 1) Size: 4'-0" x 4'-0" minimum or as required to show color, texture, and pattern variations.
 - 2) Mock-up shall be part of final construction once approved by **Architect** and **Owner**.
- b. Mock-up shall comprise of all components and finishes as specified and indicated in Drawings.
 - 1) Install a fully finished mock-up for each tile type and installation type for review and approval, including all components for the complete assembly, including but not limited to:
 - a) Floor tile
 - b) Base tile or transition
 - c) Wall tile
 - d) Outside corners
 - e) Inside corners
 - f) Trim pieces including at top edge of wall tile
 - g) Grout
 - h) Sealant
 - i) Sealer on grout mock-up shall be done in field in a non-conspicuous location for review by **Architect**.
 - j) Tile sealer mock-up shall be provided on tile as part of samples submittal.
- c. Tile and grout mock-up will be reviewed for layout, color range, pattern, lippage, joint quality and consistency, and workmanship.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer shall have been in business for **Five (5)** years providing/finishing similar size projects and complexity.
- C. Installation System Manufacturer specializing in adhesive, mortar, grout and other tile assembly installation materials shall have minimum **Ten (10)** years' experience and ISO 9001 certification.
 1. Obtain installation materials from single source manufacturer to ensure consistent quality, full compatibility, and compliance with specified warranty requirements.
- D. Lead Times:
 1. Bidders and **General Contractor** shall coordinate with supplier to verify product lead times during bid and at award of contract, and account for such lead times in their costs and schedules.
 - a. Bidders shall certify in writing that all materials have acceptable lead times as they relate to availability for sub-contractor and **General Contractor** to meet construction schedule and sequence of construction.

- 1) Bidders shall provide an itemized list of materials which might have or are confirmed to have a lead time problem and what the anticipated lead time is.
 - 2) Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid.
 2. **General Contractor** and **Subcontractor** shall be responsible for preparing submittals and obtaining Architects review and acceptance of submittal, and for ordering materials in time to meet the construction schedule.
 - a. Additional time required of **Architect** to reselect materials or review alternate proposed materials due to the failure of the **General Contractor** and **Subcontractor** to accommodate sufficient time for these activities, including the potential for submittal revision and resubmittals, may be back charged to the **General Contractor** by the **Owner**.
- E. Stipulations
1. Installation materials including adhesive, thin set, grout and sealant shall be used from a single manufacturer in order to provide specified extended system warranty.
 2. All finish floor surface material shall meet or exceed the minimum "ADA" Minimum Coefficient of Friction.
 3. Tile contractor, by commencing the work of this section, assumes overall responsibility to assure that all assemblies, components and parts shown or required within the work of this section comply with contract documents and are compatible with each other and with the conditions and expected use.
 4. Floors to receive tile finish shall not be leveled with gypsum- or asphalt-based compounds.
- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
1. Agenda for meeting shall include, but not be limited to:
 - a. Substrate preparation
 - b. Substrate vapor emission & alkalinity testing and compliance
 - c. Adhesion testing
 - d. Flooring transitions
 - e. Crack and waterproofing application to substrates
 - f. Wall penetrations
 - g. Caulking and sealing
 - h. Joints – expansion and control
 - i. Grout types
 - j. Mock up
 2. **General Contractor** shall request meeting at least three weeks prior to commencing work.
- G. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation work to review installation procedures.
1. Manufacturer's representative shall review and certify in writing all phases of construction to verify the complete work meets specification requirements.

- 2. Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.
- H. Installation of tile shall be done under finished (not temporary) lighting conditions to ensure tile is properly spaced, flush, and true.
- I. Comply with ANSI Standard for Tile Installation Material and current Tile Council of America Handbook for products and materials indicated for setting and grouting.
- J. Refer to drawings and to these specifications for criteria related to control joints at walls and floors.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Deliver materials to building site in manufacturer's labeled, unbroken containers.
- C. Store tile and installation system materials in a dry location; handle in a manner to prevent chipping, breakage, and contamination.
- D. Protect latex additives, organic adhesives, epoxy adhesives and sealants from freezing or overheating in accordance with manufacturer's instructions; store at room temperature when possible.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.
- B. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during and after installation.
- C. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.
- D. Maintain minimum and maximum temperature limits as recommended by manufacturers.
- E. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.
- F. Do not apply materials on wet or damp surfaces.
- G. Defer laying tile until other work that might cause damage to flooring has been completed.
- H. Concrete surfaces shall be:
 - 1. Cured a minimum of 28 days at 70° F, including an initial seven (7) day period of wet curing.
 - 2. Wood float finished, or better, if the installation is to be done by the thick bed method.
 - 3. All curing compounds or topical vapor emissions treatments shall be removed and/or concrete floor scarified for proper adhesion of adhesives, mortars, membranes, etc.
- I. Advise **General Contractor** of any surface or substrate conditions requiring correction before tile work commences.

1. Beginning of work constitutes acceptance of substrate or surface conditions.
- J. Maintain ambient temperature not less than 50°F or more than 100°F during installation and for a minimum of seven (7) days after completion.
 1. There should be no ice in/on slab.
 - a. Freezing after installation will not damage latex Portland cement mortars.
 2. Protect Portland Cement based mortars and grouts from direct sunlight, radiant heat, forced ventilation (heat & cold) and drafts until cured to prevent premature evaporation of moisture.
 3. Epoxy mortars and grouts require surface temperatures between 60°F and 90°F at time of installation.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish additional 25-year System Warranty which is in addition to initial manufacturer and Contractor product and installation warranty.
 1. Warranty shall cover the replacement of Finish tile material, all installed materials, sealants, adhesives, mortar bed, grout, etc. for a period as herein listed:
 - a. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner** by product manufacturer.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to, the following:
 1. Concrete slab substrate
 2. Concrete deck substrate
 3. Wood deck substrate
 4. Wall and ceiling framing
 5. Wall sheathing and substrates
 6. Wall, floor & ceiling penetrations
 7. Plumbing
 8. Electrical

B. Related Sections include, but are not limited to:

1. Division 1
2. Section 03 30 00 – Cast-in-Place Concrete
3. Section 05 40 00 – Cold-Formed Metal Framing
4. Section 06 10 00 – Rough Carpentry
5. Section 06 20 00 – Finish Carpentry
6. Section 06 61 00 – Solid Polymer Fabrications
7. Section 06 61 19 – Quartz Surfacing Fabrications
8. Section 07 26 00 – Concrete Slab Vapor Emission Control Treatment
9. Section 07 92 00 – Sealants and Caulking
10. Section 09 22 16 – Non-Structural Metal Framing
11. Section 09 29 00 – Gypsum Board & Sheathing Substrates
12. Section 10 28 00 – Toilet Accessories

1.11 OPERATION AND MAINTENANCE DATA

A. Submit as part of project closeout:

1. Complete instructions regarding maintenance of the materials, finishes, etc.
2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. Proceed with tile work only after curbs, vents, drains, piping, and other projections through substrate have been installed and when substrate construction and framing of openings have been completed.
- D. **General Contractor** shall coordinate slab vapor emission and PH testing of concrete floor treatments, or removal thereof, prior to the installation of finish flooring as herein specified. Coordinate with Section 07 28 00 Concrete Slab Vapor Emission and Alkalinity Control Treatment.

1.13 EXTRA MATERIAL

A. Submit as part of project closeout:

1. Provide extra material for each product type, color, finish, etc. in same lot as installed product.
 - a. Furnish written certification that extra materials supplied have been inspected and confirmed to be the same as those used in the Work.
2. Provide extra material in unopened fully labeled containers
 - a. Do not supply anything less the full cartons / containers.
 - b. Furnish in factory packaged and labeled cartons and identify cartons with Project name, location(s) within building (room names/numbers).

- c. Deliver extra materials to location directed by the **Owner** just prior to substantial completion.
- 3. Provide the following:
 - a. 10% minimum of installed quantity of each full-size floor, wall, or coved base tile for each product, color, texture, etc. installed.
 - 1) Provide material in sealed boxes and clearly labeled with:
 - a) Tile designation per drawings
 - b) Material manufacturer, product, color, finish, and texture
 - b. 10% minimum of each grout used labeled with:
 - 1) Grout designation per drawings
 - 2) Grout manufacturer, product type, product name, and color
 - c. 2 gallons of each cleaner and sealer used labeled with:
 - 1) Sealer manufacturer and product names
 - d. 2 tubes of each sealant color labeled with:
 - 1) Sealant manufacturer, product name, and color names

1.14 GENERAL SYSTEM DESCRIPTION

- A. Tile and stone installation integral with membranes, adhesives, grouts, sealants, etc.
- B. Installation of products from single manufacturer as required to meet extended system warranty specified herein.
 - 1. Use of products from multiple manufacturers is not acceptable.
- C. **Tile Assemblies, typical U.O.N.:**
 - 1. TCNA F122 - Thin Set Tile Floor Assembly
 - a. Tile and Grout o/
 - b. Latex Portland Cement Mortar Bond Coat o/
 - c. (Bonded) Waterproofing / Anti-Fracture Membrane o/
 - d. Concrete or cured mortar bed
 - 2. TCNA W245 – Thin-set Tile Interior Wall Assembly
 - a. Tile and Grout o/
 - b. Latex Portland Cement Mortar Bond Coat o/
 - c. Coated Glass Mat Water Resistant Gypsum Backer Board (per Section 09 29 00) o/
 - d. Wood or Metal Studs

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS TILE AND STONE

- A. Single-source responsibility specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers and installers shall be one of the following, and as listed herein and in Drawings:
 - 1. Tile:
 - a. Refer to Drawings for specifications and manufacturer name(s).
 - 2. Tile installation assembly products (all products from one manufacturer as required to meet specified warranties):
 - a. Laticrete, www.laticrete.com
 - b. MerKrete, www.merkrete.com
 - c. Custom Building Products, www.custombuildingproducts.com
 - 3. Transition Trims
 - a. Schluter www.schluter.com
 - b. Blanke Corp., www.blankecorp.com
 - 4. Sealers and Cleaners:
 - a. Laticrete, www.laticrete.com
 - b. MerKrete, www.merkrete.com
 - c. Custom Building Products, www.custombuildingproducts.com
 - d. Miracle Sealants, www.rustoleum.com/pages/miracle-sealants
 - 5. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. **Wall and Ceiling Sheathing**

- 1. Refer to Section 09 29 00 – Gypsum Board and Sheathing Substrates

B. **Grout:**

- 1. Application: Typical, U.N.O.
 - a. Mfgr: Laticrete
 - b. Product: PermaColor

c. Material: High performance, fast setting polymer fortified grout featuring built-in Microban Anti-Microbial Protection

d. Standards:

- 1) ANSI A118.6
- 2) ANSI A118.7
- 3) EN 13888
- 4) ISO 13007

e. Properties:

- 1) Tensile Strength: 510 psi (3.5 MPa)
- 2) Compressive Strength: 4750 psi (32.8 MPa)
- 3) Flexural Strength: 1400 psi (9.65 MPa)
- 4) Linear Shrinkage: 0.065%
- 5) Water Absorption: 3.25%

f. Testing:

Test	Test Method	ISO 13007-3 CG2WA Specification	Results
28 Day Cure Abrasion Resistance	ISO 13007-4 4.4	Less than or equal to 1,000 mm ³ (0.061 in ³)	121–132 mm ³ (0.0074– 0.0081 in ³)
28 Day Cure Flexural Strength	ISO 13007-4 4.1.3	Greater than 2.5 MPa (362 psi)	8.5–9.2 MPa (1226– 1340 psi)
6 Day 21 Day Water Soak 25 Freeze/Thaw Cycle Flexural Strength	ISO 13007-4 4.1.3	Greater than 2.5 MPa (362 psi)	3.31–3.79 MPa (480– 550 psi)
28 Day Cure Compressive Strength	ISO 13007-4 4.1.4	Greater than 15 MPa (2175 psi)	35.7–36.8 MPa (5,176– 5,339 psi)
28 Day Cure Shrinkage	ISO 13007-4 4.3	Less than 3 mm/m (0.12 in./3.28 ft)	0.51–0.62 mm/m (0.02–0.024 in/3.28 ft)
28 Day Water Absorption Soaked 30 Minutes	ISO 13007-4 4.2	Less than 2 g (0.0044 lb)	0.09–0.14 g (0.0002– 0.0003 lb)
28 Day Water Absorption Soaked 240 Minute	ISO 13007-4 4.2	Less than 5 g (0.011 lb)	0.54–0.7 g (0.0012– 0.0015 lb)

C. Latex Portland Cement Mortar Bond Coat, Mortar Bond Coat and/or Bond Coat:

1. Mfg: Laticrete
2. Product: 254 Platinum
3. Material: One-step, polymer fortified, thin-set mortar
4. Standards:
 - a. ANSI A118.4
 - b. ANSI A118.11
 - c. ANSI A118.15
 - d. EN 12004
 - e. ISO 13007-1

5. Properties:

Test	Test Method	Results	Specification
28 day Cure Porcelain Tile Shear Strength	ANSI A118.15 7.2.5	475-575 psi (3.3-4.0 MPa)	>400 psi (2.76 MPa)
Shear Bond Porcelain Tile Water Immersion	ANSI A118.15 7.2.4	250-300 psi (1.7-2.4 MPa)	>200 psi (1.38 MPa)
28 day Heat Aging Tile Shear Strength	ANSI A118.15 7.2.7	600-700 psi (4.1-4.8 MPa)	>400 psi (2.76 MPa)
28 day Cure Quarry Tile to Plywood Shear Bond	ANSI A118.11 4.1.2	250-300 psi (1.7-2.1 MPa)	>150 psi (1.0 MPa)
28 Day Cure Tensile Adhesive Strength	ISO 13007-2 4.4.2	1 MPa (145 psi)	1.8 – 2.6 MPa (261- 377 psi)
7 Day Cure 21 Day Water Immersion Tensile Adhesive Strength	ISO 13007-2 4.4.3	1 MPa (145 psi)	1.3-1.5 MPa (174- 221 psi)
14 Day Cure 14 Day Heat Age Tensile Adhesive Strength	ISO 13007-2 4.4.4	1 MPa (145 psi)	2.4-3.0 MPa (345- 438 psi)
7 Day Cure 21 Day Water Immersion 25 Freeze/Thaw Cycle Tensile Adhesive Strength	ISO 13007-2 4.4.5	1 MPa 145 psi)	2-1.7 MPa (171- 247 psi)
Open Time After 30 Minutes	ISO 13007-2 4.1	0.5 MPa (73 psi)	1.3-1.9 MPa (190- 283 psi)
Slip	ISO 13007-2 4.2	Less than or equal to 0.5 mm (0.02 inches)	0.5 mm (0.02 inches)
Transverse Deformation	ISO 13007-2 4.5	Greater than or equal to 2.5 mm (0.1 in.) and less than 5 mm (0.2 in.)	3.2-3.6 mm (0.13- 0.14 in.)

D. Bonded Membrane and/or Bonded Anti-Fracture Waterproofing Membrane:

1. Application: Typical, U.N.O.

- a. Mfgr: Laticrete
- b. Product: HydroBan
- c. Properties:

Physical Property	Test Method	Results
7-day Hydrostatic Tes	ANSI A118.10	Pass
7-day Breaking Strength	ANSI A118.10	265–300 psi (1.8– 2.1 MPa)
7-day Water Immersion	ANSI A118.10	95–120 psi (0.7–0.8 MPa)
7-day Shear Bond	ANSI A118.10	200–275 psi (1.4– 1.9 MPa)
28-day Shear Strength	ANSI A118.10	214–343 psi (1.5– 2.3 MPa)
System Crack Resistance Test	ANSI A118.12.5.4	Pass (High)

Water Vapor Transmission	ASTM E 96– 00E1 Procedure B	0.515 grains/h • ft ² (0.3602 g/h • m ²)
Water Vapor Permeance	ASTM E 96– 00E1 Procedure B	1.247 perms 71.21 (ng/Pa • s • m ²)
System Performance	ANSI A118.10; ASTM C627; TCA Rating	cycles 1–14 "Extra Heavy"
Potability of Water Applicable to Waterproofing Systems	NBR 12170:2009 (Technical Norm from Brazil)	Pass
Tensile Strength for Elongation		250%
Thickness (Dried)		20–30 mils (0.5–0.8 mm)

E. Shower Pan:

1. Application: Typical Shower Pan, u.o.n.

- a. Mfgr: Laticrete
- b. Product: HydroBan Sheet Membrane
- c. Material: Single component, self-curing liquid rubber polymer that forms a flexible, seamless waterproofing / crack isolation membrane that does not require the use of a fabric in the field.
- d. Standards:
 - 1) ANSI 118.10
 - 2) ANSI A118.12
 - 3) IAPMO PS106 approved

e. Properties:

Physical Property	Test Method	Results
Seam Strength	ASTM D751	32.7 lbs/in. (0.6kg/mm)
Breaking Strength Transverse	ASTM D751 Procedure B	1298 psi (9.0 MPa)
Breaking Strength Longitudinal	ASTM D751 Procedure B	1867 psi (12.9 MPa)
Waterproofness	ASTM D4068	Pass
7-Day Dry Shear Strength	ASTM C482	175 psi (1.2 MPa)
7-Day Water Immersion Shear Strength	ASTM C482	107 psi (0.7 MPa)
4-Week Shear Strength	ASTM C482	103 psi (0.7 MPa)
12-Week Shear Strength	ASTM C482	105 psi (0.7 MPa)
100-Day Water Immersion Shear Strength	ASTM C482	113 psi (0.8 MPa)
Permeance	ASTM E96 Procedure E	0.06 Perm (inch-lb)
Water Vapor Transmission	ASTM E96 Procedure E	0.104 grain/hrft ²
Service Requirement	ASTM C627	Rated Extra Heavy (TCNA)
Resistance to Temperature:		min./max. -22°F / +194°F (- 30°C / + 90°C)

Total Thickness (approximate)	Physical measurement	20-30 mils (0.5-0.7 mm)
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2. Sealant and backer rod and/or bond breaker tape:

- a. Application: Expansion & Control Joints, typical
- b. Manufacture: Laticrete
- c. Product: Latasil
- d. Standards:
 - 1) ASTM C794
 - 2) ASTM C920
 - 3) Backer rod: As approved by sealant mfgr. and in accordance with details and TCNA
 - 4) Bond Breaker Tape: As approved by sealant mfgr. and in accordance with details and TCNA

e. Properties:

Service Temperature Range	-40°F (-40°C) to +350°F (177°C)
Sag or Slump	None
Tack Free Time at 77° F (25° C), 50% RH	17 minutes
Tooling Time	7 – 10 minutes
Durometer Hardness -Shore A	27
Tensile Strength	280 psi (1.9 Mpa)
Dynamic Joint Movement	+/- 25%
Weatherability, 10,000 hours QUV Weatherometer	No change

- f. Joint Size: Match Grout Width, U.N.O.
- g. Color: As Selected by **Architect** for each Grout Color Condition
- h. Primer: Latasil 9118 Primer

3. Sealer - Floor Sealer & Slip Protection & Grout Sealer:

- a. Application: Typical, U.N.O.
- b. Manufacturer: Miracle Sealants & Abrasive Co.
- c. Product: 511 Impregnator – Natural look penetrating sealer
- d. Material: Polymerized Silicone
- e. Standard: Static coefficient of friction as herein specified

4. Sealer - Wall and Ceiling Grout Sealer:

- a. Application: Typical, U.N.O.
- b. Manufacturer: Miracle Sealants & Abrasives Co.
- c. Products:
 - 1) Typical, u.o.n.: 511 Impregnator – Natural look penetrating sealer
 - 2) Porous surfaces: 511 Porous Plus – Natural look penetrating sealer
 - a) Use for Sanded Grout, Granite, Marble, Slate, Limestone, Saltillo Tile, Terra Cotta

- d. Material: Polymerized Silicone
- e. Standard: 0.6 max "Static Coefficient of Friction"
- 5. Sealer - Tile Countertop & Countertop Grout Sealer:
 - a. Application: Typical
 - b. Manufacturer: Miracle Sealants & Abrasives Co.
 - c. Products: 511 H2O – Water Base Penetrating sealer
 - d. Material: Polymerized Silicone
 - e. Exceptions: Do not use at epoxy grouts
- 6. Cleaner - Surface:
 - a. Application: Typical
 - b. Manufacturer: Miracle Sealants & Abrasives Co.
 - c. Product: Mira Clean #1

F. Accessories:

- 1. Floors - Same Height Transitions:
 - a. Application: Tile to Carpet and Tile to Tile
 - 1) Manufacturer: Schluter
 - 2) Model: Schiene
 - a) Provide Schluter Schiene-R at radius conditions
 - 3) Finish:
 - a) AE Satin Aluminum Anodized
 - b) A Aluminum
 - 4) Height: To match finish height of tile when installed
- 2. Floors - Different Height Transitions:
 - a. Application: Tile to lower flooring materials (adjustable slope):
 - 1) Manufacturer: Schluter
 - 2) Model: Reno-V
 - 3) Finish: AE Anodized Aluminum
 - 4) Height: To match finish height of tile when installed
 - 5) Slope Leg:
 - a) 3/4"
 - b) 1-3/16"
 - c) 1-9/16"
- 3. Cove Shaped Profile - Wall Tile to Floor tile:
 - a. Application: Aluminum Tile Wall to Tile Floor coved transition
 - 1) Manufacturer: Schluter

- 2) Model: DILEX-AHK
- 3) Finish:
 - a) AE Satin Anodized Aluminum
- 4) Height: To match finish height of floor tile when installed
- 5) Accessories:
 - a) Outside Corner
 - b) Inside Corner
 - c) Connector
 - d) End Cap

- G. Portland Cement Mortar Floor Bed: Consisting of uniform mortar thickness 1-1/4" min. to 2" max, conforming to ASTM C150, Type 1 and ASTM C144
- H. Portland Cement: ASTM C150 Type 1
- I. Sand: ASTM C144
- J. Water: Potable

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Examine substrates where tiles will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - a. Verify that substrates for setting tile are well cured; structurally sound dry, clean, and free from oil or waxy films, and curing compounds.
 - b. Verify that substrate is clean and free of dust, dirt, oil, grease, sealers, curing compounds, laitance, efflorescence, form oil, loose plaster, paint, and scale.
 - c. Verify that substrate is level and true to within 1/4" in 10' from the required plane and no more than 1/16" in 12" when measured from the high points in the surface for applications by the thin bed method or for installation of veneer work over thin waterproofing membrane.
 - d. Verify that substrate is not leveled with gypsum or asphalt-based compounds.
 - e. Verify substrate is dry per ASTM D4263 – Standard Test for Determining Moisture in Concrete by the Plastic Sheet Method.

3. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

- a. Do not proceed with installation until unsatisfactory conditions have been corrected. Commencement of work signifies acceptance of substrate and installation conditions.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.
 2. Confirm all surface treatments, including but not limited to waterproofing and crack isolation membranes, are installed properly before proceeding.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations
- B. Prepare as follows, but not limited to:
 1. Remove protrusions, bumps, and ridges by grinding or chipping.
 2. Repair, fill, and level cracks, holes, depressions and rough or chipped areas in substrate using patching material recommended by setting materials manufacturer.
 3. Concrete slab to have steel trowel or light broom finish when tile is installed by the thin-set method.
 - a. Level floors in accordance with Section 03 00 61 - Concrete Floor Leveling, Patching and Grouting – Cementitious.
 - 1) Gypsum material is not allowed.
 - b. Surfaces shall be clean and well cured.
 4. Ensure substrate is within level tolerances:

3.4 INSTALLATION

- A. General:
 1. Perform work in accordance with ANSI standards, TCNA methods, manufacturer's installation instructions, and in accordance with the drawings; where in conflict, the most stringent shall apply.
 2. Provide threshold trim strips or other edging material where tile terminates at dissimilar finishes, u.o.n.
- B. Pre-Treatment

1. Cracks & Joints
 - a. Fill all substrate cracks, cold joints and control joints to a smooth finish using a Laticrete latex-fortified thin-set.
 2. Coves and Floor/Wall Intersections
 - a. Fill all substrate coves, floor/wall transitions and changes in plane to a smooth finish using a Laticrete latex-fortified thin-set.
 3. Drains
 - a. Drains must be of the clamping ring type, with weepers as per ASME A112.6.3.
 - b. Waterproof membranes shall connect at the clamping ring (or the integrated bonding flange where specified by TCNA design) to manage water from floor into drain.
 4. Penetrations
 - a. Allow for a minimum 1/8" space between drains, pipes, lights, or other penetrations and surrounding ceramic tile, stone or brick. Pack any gaps around pipes, lights or other penetrations with a Laticrete latex-fortified thin-set.
 5. Main Application:
 - a. Allow any pre-treated areas to dry to the touch prior to proceeding.
- C. Placement
1. Place tile material in accordance with patterns indicated or as directed by Architect; carefully plan tile layouts, ensure pattern is uninterrupted from one surface to the next and through doorways.
 2. Neatly cut tile around fixtures and drains; accurately from corners, base, intersections and returns.
 - a. Use tile cutting saw to cut tile, typ.
 - b. Hone edges of all cut tiles to eliminate rough-cut edges.
 - c. At wall tile penetrations install hole cutout, do not notch.
 - d. Use inside and outside tile trim units as herein specified and/or indicated in Drawings.
 3. Ensure tile joints are uniform in width, subject to normal variance in tolerance allowed in tile size. Ensure joints are tight, without voids, cracks, excess mortar or grout; spacers shall be used to set joints between tiles, typical.
 4. Install metal edge trim at transitions to door frames.
 5. **Back butter** all tile during installation
 6. Sound tile after setting, remove and replace hollow sounding units.
 7. Allow tile to set for a minimum 48 hours prior to grouting.
 - a. Provide and install required sealants and caulking at areas around through wall pipes, plumbing, and other wall penetrations.
 - b. Provide sealant joint where tile butts against other wall finishes.

- D. The word "tile" is used as general name for all floor, wall and counter top materials.
- E. Floor area & wall base – Typical, U.O.N.
 - 1. Slab shall be well cured, level and free of cracks
 - 2. Sheet and Liquid Membranes:
 - a. Install thin set mortar as slurry bond coat over substrate prior to installation of thick bed mortar.
 - b. Install Crack Protection / Thin-set Sheet Waterproofing membrane over entire floor substrate and up face of wall 8" at tile base, typ.
 - c. Test Waterproofing system/assembly with EFVM method or other measure as approved by **Architect**. Replace / repair all defective conditions discovered by testing.
 - d. Install per manufacturer's recommendations.
 - 3. Bond coat mortar:
 - a. Install per manufacturer's recommendations, TCNA standards and as herein specified and modified.
 - 4. Grout with color as selected by **Architect**.
 - 5. Joints: Expansion, construction, isolation, contraction and perimeter joints
 - a. Refer to most current TCNA Handbook, Method EJ171-07 for recommendations on locating, treating and detailing various types of construction joints.
 - 1) Joints not to exceed in spacing beyond 25'-0" for interior wall tile
 - 2) Install sealant with bond breaker tape at transitions to dissimilar material
 - 3) Install sealant with bond breaker tape at changes in plane of tile.
 - 4) Install using primer as recommended by sealant manufacturer.
 - 5) Install sealant with backer rod at expansion joints.
 - 6. Tile installation
 - a. General
 - 1) Custom cutting required to provide curved and miscellaneous special shapes use "Water Jet" cutting method exclusively.
 - 2) Jobsite Blending: blend tiles before installing in accordance with reference standards to produce an even range and distribution of color and finish.
 - b. Installing Tile:
 - 1) Install tile in pattern indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size.
 - a) Adjust to minimize tile cutting and to avoid tile less than half size.
 - 2) Smooth cut edges of tile and/or use appropriate cutter or wet saw to produce smooth cuts.
 - a) Provide straight cuts which align with adjacent materials.

- 3) Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption.
- 4) Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.
- 5) Provide tile joints uniform in width, subject to variance in tolerance allowed in tile size.
 - a) Make joints smooth and even, without voids, cracks, or excess mortar or grout.
- 6) Mix mortar in strict accordance with manufacturer's recommendations.
- 7) Apply setting material in accordance with manufacturer's directions and install tile before bonding mortar has started initial cure.
 - a) For thin set mortar application, use a notch trowel that will achieve the recommended coverage of mortar after tiles have been installed.
 - b) Reference standard coverage information and follow manufacturer's recommendations for trowel size when using mortars.
- 8) Do not spread more material than can be covered within 10 to 15 minutes. If "skinning" occurs, remove bonding mortar and spread fresh material. Spread bonding mortar with notches running in one direction, which shall be perpendicular to the pressing, pushing and pulling of tile during placement.
- 9) Place tile in fresh bonding mortar, press, push and pull the tile slightly to achieve as near 100% coverage and contact of tile with setting material and substrate as possible.
 - a) The coverage shall be no less than 85% and be sufficiently distributed to give full support of the tile.
 - b) Make sure that all corners and edges are well supported with mortar. Leave no hollow corners or edges.
 - i. NOTE: 95-100% coverage is mandatory for wet or exterior areas.
 - c) A small amount of bonding mortar can be placed onto the entire back of the tile using a trowel in order to assist in optimum adhesion and coverage of the bonding mortar being used.
- 10) Ensure there is a minimum 1/8" of bonding mortar between tile and substrate after proper bedding.
 - a) Installer must periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications.
 - b) If coverage is found to be insufficient, use a larger size notch trowel.
- 11) Use a beating block and hammer or rubber mallet so that faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce slippage.

7. Thick Bed (Wire Reinforced) Method

- a. Install mortar bond coat over concrete substrate prior to installation of thick bed mortar with reinforcing.
- b. Minimum bed thickness per TCNA design shall be maintained.

- c. Place thick bed mortar to a depth approximately one-half finished bed thickness in compliance with ANSI, TCNA and manufacturers standards.
 - 1) Lay 2" x 2", 16 gauge galvanized, welded reinforcing wire fabric, complying with ANSI, TCNA and manufacturers standards.
 - d. Place additional thick bed mortar over wire fabric and compact mortar by tamping with flat trowel.
 - 1) Screed mortar bed level and provide correct slopes to drains.
8. Thin Set Method:
- a. Install thin set mortar in compliance with herein specified standards and manufacturers recommendations.
 - b. Use the appropriate trowel notch size to ensure proper bedding of the tile, brick or stone selected.
 - 1) Work the thinset mortar into good contact with the substrate and comb with notched side of trowel.
 - 2) Spread only as much thinset mortar as can be covered while the mortar surface is still wet and tacky.
 - 3) When installing tile/stone, rib/button, lug back tiles, pavers or sheet mounted ceramics/mosaics, spread thin set mortar onto the back of (back-butter) each piece/sheet in addition to troweling thinset mortar over the substrate.
 - a) Beat each piece/sheet into the thinset mortar with a beating block or rubber mallet to insure full bedding and flatness.
 - b) Allow installation to set until firm.
 - c) Clean excess thinset mortar from tile or stone face and joints between pieces.

3.5 INSTALLATION – GROUT AND SEALANT JOINTS

A. Grouting:

- 1. Install grout in accordance with manufacturer's written instructions.
- 2. Follow manufacturer's recommendations for minimum cure time prior to grouting.
- 3. Remove spacers and debris in grout joints; remove dust/dirt off tile faces using a wet sponge. Do not leave water standing in joints.
- 4. Spread using a sharp edged, firm rubber grout float; work grout diagonally across joints, packing them full.
- 5. Cut excess grout of the tile surface using the edge of the float held at a 90degree like a squeegee stroking diagonally to avoid pulling grout out of filled joints.
- 6. Initial cleaning of the remaining film/haze can begin approximately at the manufacturer's specified time after grouting (wait slightly longer at colder temperatures).
 - a. Dip a clean sponge into the bucket and then wring out cleaning solution until sponge is damp.

- b. Wipe grout joints and tile surface in a light circular motion, loosening grout residue while keeping the joints smooth and full.
 - c. Drag a clean sponge diagonally over the scrubbed surfaces to remove any remaining grout residue.
 - d. Rinse sponge frequently and change wash water at least every 50 s.f.
 - e. Discard sponges as they become "gummy" with residue.
 - f. Check work as you clean. If necessary, repair any low spots with additional grout.
7. Final Cleaning
 - a. Allow cleaned areas to dry as with initial cleaning and inspect tile/stone surface.
 - b. Begin final cleaning when grout joints are hard to the touch, depending upon the size of the grout joint and the ambient temperature.
 - c. Use only clean water and simply dunk the white nylon scrub or scouring pad in the water and let all the water pour out – it should be nearly dry and then start to break up the grout haze left from the initial wash on the surface of the tiles.
 - d. Rinse scrub pad frequently, letting all water escape before continuing to clean.
 - e. Then, use a clean cloth to the scrubbed surfaces to remove any residue.
 - f. Allow cleaned areas to dry and inspect tile/stone surface.
 - 1) Make certain to check tile surface with adequate lighting after the tile surface is dry.
 - 2) Continue cleaning until all film/haze has been removed.
 - g. Inspect grout joint for pinholes/voids and repair them with freshly mixed grout.
8. Cautions:
 - a. Do not use undiluted white vinegar on polished marble or limestone unless a test spot in an inconspicuous area indicates no change in finish appearance;
 - b. Do not use acid cleaners on epoxy grout less than 7 days old.
- B. Expansion and Control Joints:
 1. Provide control joints (CJ), expansion joints (EJ) and transition joints as located in contract drawings and in full conformity, especially in width and depth, with architectural details and to include the following locations, but not limited to:
 - a. Wall penetrations
 - b. Edges of tile abutting dissimilar materials.
 - c. Floor penetrations.
 - d. Inside horizontal and vertical corners
 2. Installation shall incorporate the following:
 - a. Substrate joints must carry through, full width, through the tile & stone material.
 - b. Install expansion joints in tile or stone over construction/cold joints or control joints in substrates.
 - c. Install expansion joints where tile or stone abut restraining surfaces (such as perimeter walls, curbs, columns), changes in plane and corners.

- d. Joint width and spacing depends on application - follow TCNA "Handbook for Ceramic Tile Installation" Detail "EJ-171 Expansion Joints" and refer to grout assembly schedule.
 - 1) Joint width: $\geq \frac{1}{8}"$ and $\leq 1"$.
 - 2) Joint width: depth ~2:1 but joint depth must be $\geq \frac{1}{8}"$ (3mm) and $\leq \frac{1}{2}"$.
- e. Layout (field defined by joints):
 - 1) 1:1 length: width is optimum but must be $\leq 2:1$.
 - 2) Remove all contaminants and foreign material from joint spaces/surfaces, such as dirt, dust, oil, water, frost, setting/grouting materials, sealers and old sealant/backer.
 - 3) Use Laticrete Latasil™ 9118 Primer for underwater and permanent wet area applications, or for porous stone (e.g. limestone, sandstone etc...) installations.
 - 4) Install appropriate Backing Material (e.g. closed cell backer rod) based on expansion joint design and as specified in Section 07 92 00.
 - 5) Apply masking tape to face of tile, brick or stone veneer.
 - 6) Use caulking gun, or other applicator, to completely fill joints with sealant.
 - a) Within 5-10 minutes of filling joint, 'tool' sealant surface to a smooth finish.
 - b) Remove masking tape immediately after tooling joint.
 - c) Wipe smears or excess sealant off the face of non-glazed tile, stone or other absorptive surfaces immediately.
 - 7) Floor and wall grout joints shall align from floor to wall when same sizes are used.
 - 8) Use spacers of width specified to set tile and maintain proper grout width.
 - 9) Tool joints to be uniform and within tile edges, remove all grout from face of tile and at inside and outside corners.
 - 10) Tool grout so surface of grout is even with tapered edge of tile.

3.6 INSTALLATION – SEALERS AND SLIP PROTECTION

- A. Seal all grout with product as herein specified.
- B. Install sealer in accordance with manufacturers.
 - 1. After tile has been grouted, ensure that all grout residues is removed from the surface of the tile with a clean sponge and approved cleaner as herein specified and approved by tile manufacturer.
 - 2. Clean surface to ensure that tile is free of lime and water spots in addition to oil, grease, etc.
 - 3. Allow grout to dry for a minimum of 24 hours.
 - 4. Once tile area has been cleaned and dried, proceed with the sealing of the grout and tile with a sealer as herein specified and approved by tile manufacturer and with manufacturer's approved applicators.
 - 5. Install sealer per manufacturer's coverage chart.
 - 6. Install sealer at minimum room temperature of 65°F.
 - 7. Wipe off excess sealer with a clean towel prior to drying.
 - 8. Allow sealer to dry 60 minutes prior to foot traffic being allowed on the treated surface.

3.7 FIELD QUALITY CONTROL

TILE AND STONE

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 - 1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 - 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.8 CLEANING AND PROTECTION OF INSTALLATION

- A. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter, in accordance with manufacturer's instructions. If a grout haze or residue remains, use a suitable grout haze remover or cleaner and contact grout manufacturer for recommendations. Flush surface with clean water before and after cleaning. Do not use harsh hydrochloric, muriatic or sulfuric acid or acid-based cleaners to clean glazed tiles or tiles grouted with latex modified grout.
- B. When necessary, acceptable tile cleaning acids or heavy cleaning of grouted with Portland cement grout shall not be done sooner than 10 days after grouting. Tile and grout shall be soaked with water before cleaning. In the absence of a recommendation from the grout manufacturer, acid cleaning may be done with a saturated solution of phosphoric or sulfuric acid, mixed in accordance with manufacturer's recommendations.
- C. After cleaning, provide protective covering and maintain conditions to protect tile work from damage or deterioration. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, and during move-in of furniture and equipment, cover protective covering with 1/4" hardboard, plywood, or similar material.
- D. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
- E. Consult most current manufacturers "Care & Maintenance" for information on post installation cleanup and routine maintenance.
- F. Keep floors installed with epoxy adhesive closed to foot traffic for 24 hours @ 70°F, and to heavy traffic for 48 hours @ 70°F unless instructed differently by manufacturer. Use kneeling boards, or equivalent, to walk/work on newly tiled floors. Cure tile work in swimming pools, fountains and other continuous immersion applications for 10 days @ 70°F for epoxy grout and 14 days @ 70°F for latex Portland Cement based grout before flood testing or filling installation with water. Extend period of protection of tile work at lower temperatures, below 60°F, and at high relative humidity (>70% RH) due to retarded set times of mortar/adhesives. Replace or restore work of other trades damaged or soiled by work under this section.
- G. Protect Crack Protection / Thin-set Waterproofing Membrane Assembly during construction prior to installation of tile.

3.9 MAINTENANCE

TILE AND STONE

- A. Product shall be installed, cleaned, and sealed as herein specified and in accordance with each specific flooring manufacturers recommendations to maintain the following of their installed product, but not limited to:
 - 1. Slip Resistance
 - 2. Published (ADA approved) Slip Resistance Coefficient of Friction
 - 3. Warrantee requirements
- B. Product shall be maintained by **Owner** after occupancy to maintain the Slip Resistance and coefficient of friction rating.
- C. Refer also to PROTECTION AND CLEAN UP heading.

3.10 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition, so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the Architect after he receives the **General Contractor's** NOTICE of "Certificate of Substantial Completion".

END OF SECTION 09 30 00

SECTION 09 51 00 – ACCOUSTICAL CEILING SUSPENSION SYSTEM AND TILE

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the Owner's General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Suspended metal Tee Bar grid system complete with wall trim, hanger wire, fasteners, seismic clips, compression posts, etc. and as specified and detailed.
 - 2. Acoustical ceiling tile panels.
 - 3. Radius Accessories
 - 4. Ceiling access doors/hatches.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction:
 - a. All occupancy types.
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society For Testing and Materials (ASTM)
 - 1. ASTM C423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 2. ASTM C635 Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
 - 3. ASTM C636 Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
 - 4. ASTM E84 Surface Burning Characteristics Classification.
 - 5. ASTM E119 Fire Tests of Building Construction and Materials.
 - 6. ASTM E580 Section 5.1
- E. Ceilings & Interior Systems Construction Association, www.CISCA.org

F. International Code Council, ICC

1. ICC-ES Evaluation Reports

G. Underwriters Laboratory (UL)

1. Fire Resistance Directory, Acoustical Materials (BYIT)

H. Ceilings & Interior Systems Construction Association (CISCA)

1. Ceiling Systems Installation Handbook, most current edition

I. Abbreviations:

1. AC: Articulation Class.
2. CAC: Ceiling Attenuation Class.
3. LR: Light Reflectance Coefficient.
4. NRC: Noise Reduction Coefficient.
5. HRC: Recycled Content
6. Recycled Content: Average percentage based on weight of component materials. Material recovered or diverted from the solid waste stream, either during the manufacturing process (pre-consumer) or after consumer use (post-consumer).

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Testing shall be done as herein specified and as listed in drawings.
5. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Tee Bar Grid Assembly	Evaluation Report for construction	Comply	<ul style="list-style-type: none"> • ICC Evaluation Service, ICC-ES Evaluation Report, ESR-1222 • ASCE 7-22 Seismic Technical Guide
	Grid Flame Spread	Class I, 25 or less	UL
	Main TEE load capacity	16lbs./lf. DXL26 HRC	ASTM C635, CBC, ASCE/SEI 7 and CISCA Guidelines
	Cross TEE load capacity	DXL524	TEE Bar grid mfgr.
	System Installation	Comply	CISCA Handbook and ASTM C636

			Building code, Section 808
	Fire Rated	No	
Compression Posts	Spacing	12'-0" x 12'-0" spacing	CBC Sect. 803.9, ASTM C-635 & 636 ESR-1222 DONN/USG DSA IR-25-2
	Out of Plumb	1 horizontal x 6 vertical max	
	Slenderness Ratio	(kl/R) 200 or less	
	Attachment to main runner	Attach within 2" of cross member	
	Framing	Approved EMT	Suspension mfgr's assembly
Stud framed posts		Refer to drawings	
Assembly Seismic Rating	Design category	Heavy Duty Design category	Building Code chapter 16, ASCE7-22, CISCA, ASTM C-635, Structural drawings & DSA IR-25-2
	Earthquake Loads	Comply	Building Code, ASCE7-05, CISCA, ASTM C-635 & DSA IR-25-2
Expansion Joints – <i>Not Used</i>	N/A	At intersection of Corridors with Lobbies or other similar spaces	DSA IR-25-2, details A & B of Figure 7
Wires	Splayed wires angle	45 degrees max and taut	ASTM C-635 & 636
	Gauge	12 Ga.	DSA IR-25-2
	Diagonal wire - Attachment turns	4 tight turns over a distance of 1.5" max	CBC Sect. 803.9, ASTM C-635 & 636 DSA IR-25-2
	Vertical wire - Attachment turns	3 tight turns over a distance of 1.5" max	
Seismic Clips	Seismic assembly and compliance	Comply	CBC and mfgr's design and product requirements
Attachment lag screws	Type	I type Lag Screws	ICC ER-5397 & Building code Section 808 DSA, Product Acceptance Number, PA-079 or current approved number
Light fixtures	Hanging requirements	Min. 12ga. hanger wires must be attached to the supporting Cross Tee within 3" of the each corner of the fixture	CBC, ASCE/SEI 7 and CISCA Guidelines
Lay-In Panels	Sag Resistant	Comply for 30 years	ASTM C367
	Mold Growth	No growth for 30 years	
	Fire Rating	25 or less	ASTM E84
	Smoke Developed	Index 50	
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.
 1. Catalog cuts or standard drawings showing details of system with project conditions clearly identified and manufacturer's recommended installation instructions.
 2. Reflected ceiling plans:
 - a. Contractors shall submit a layout arrangement of ceiling design, dimensions and locations of related integrated lighting and air distribution components.
 3. Installation drawings:
 - a. Detail complete installation including suspension system, installation of related lighting and air distribution components, access requirements, sound absorption requirements, and fire rating requirements when applicable.
 4. Compression posts assembly, compliance guidelines and details for assembly and attachment.
- E. Submit samples.
 1. (6) 6"x6" sample of each color and finish of all exposed materials.
 2. (6) pieces of each type of Grid x 12" long
 3. (6) Angle moldings pieces x 12" long
 4. (6) Seismic clips
- F. Site mock-up, refer to "Mock-Up" heading.
- G. Certification and Test Reports:
 1. UL Acoustical Compliance:
 - a. For acoustical performance, each carton of material must carry Underwriters Laboratories certification for AC (if applicable), CAC and NRC.
 2. UL Suspension System Load Compliance:
 - a. Manufacturer must certify that the metal suspension system is UL Classified to be load compliant per ASTM C635. For load compliance, each carton of main tees must carry Underwriters Laboratories certification for load compliance.
 3. Test reports: Manufacturer will provide test certification for minimum requirements as tested in accordance with applicable industry standards and/or to meet performance standards specified by various agencies.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for five (5) years providing / installing / finishing similar size projects and complexity.
- C. Manufacturer shall have been in business for five (5) years providing / installing / finishing similar size projects and complexity.
- D. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid.
- E. Stipulations:
 - 1. Standard for terminology and performance: Applicable publications by Acoustical and Insulating Materials Association (AIMA), including "Performance Data, Architectural Acoustical Materials".
- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
Agenda for meeting shall include, but not be limited to:
 - 1. Ceiling mounted fixtures, etc.
 - 2. Ceiling penetrations
 - 3. Sprinkler heads
 - 4. HVAC ducting and grills
 - 5. Compression posts – assembly/construction

General Contractor shall request meeting 5 days in advance of construction.
- G. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation work to review installation procedures.
 - 1. Manufacturer's representative shall review and certify in writing all phases of construction to verify the complete work meets specification requirements.
 - 2. Written certification of all phases of construction shall be sent to the Architect by the manufacturer's representative.
- H. Miscellaneous criteria:
 - 1. Changes from system: System performance following any substitution of materials change in assembly design must be certified by the manufacturer.
 - 2. Seismic Bracing: Provide as required by Code and specific herein.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements.

- C. Storage time of materials at the jobsite should be as short as possible, and environmental conditions should be as near as possible to those specified for occupancy, refer to "Environmental Conditions" heading.
 - 1. Excess humidity during storage can cause expansion of materials and possible warp, sag, or poor fit after installation.
 - 2. Chemical changes in the mat and/or coatings can be aggravated by excess humidity and cause discoloration during storage, even in unopened cartons.
 - 3. Cartons should be removed from pallets and stringers to prevent distortion of material.
 - 4. Long-term (6-12 months) storage under uncontrolled environmental conditions should be avoided.
- D. Damaged or deteriorated materials should be removed from the premises.
 - 1. Immediately before installation, to stabilize tile and panels, store them at a location where temperature and humidity conditions duplicate those ambient during installation and anticipated for occupancy.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
- B. Installation of acoustical panels shall not begin until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from plaster, concrete, or other work as dissipated.
- C. Do not use ceiling panels in extreme or continuous high humidity, or areas exposed directly to weather or water.
 - 1. Ceiling panels are sized and designed for use within the standard occupancy range of temperature and humidity, 65-85°F (18-29°C), no more than 70% RH (relative humidity).
 - 2. Humidity can greatly affect product dimensional stability and sag resistance.
 - 3. Sag can become noticeable during periods of high humidity lasting only a few hours.
- D. Allow time for dimensional changes in ceiling panels stored at temperature/humidity conditions well outside of those recommended for service.
 - 1. With increases in temperature/humidity, these products expand (up to 1/64 in./ft. (4.3 mm/m) at 85°F (29°C)/90% RH) and may not fit into a fixed grid.
 - 2. Conversely, with decreases, these products will be undersize, but expand to normal when standard ambient conditions return.
- E. For some pattern edge details, if perimeter panels must be cut smaller, the cut edge must be field-rabbetted, or the wall angle must be lowered by (1/4") (3/8") (Reveal Depth).
- F. Environmental requirements for interior installation:
 - 1. Building shall be enclosed with windows and exterior doors in place and glazed, and roof watertight before installation of ceiling system and related ceiling components.

2. Climatic condition range of 60-85°F (16-29°C) with a max 75% RH.

G. Coordination with other work:

1. Mechanical work: Ductwork above ceiling shall be complete and permanent heating and cooling systems operating to climate conditions prior to installation of ceiling components.
2. Electrical work: Installation of conduit above ceiling shall be complete before installation of ceiling components.
3. Fire protection work: Fire protection lines and/or equipment occurring above ceiling shall be completed and tested before ceiling components are installed.

H. Protection: Protect completed work above ceiling system from damage during installation of ceiling components.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial one (1) year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of Owner within the warranty period, such defects shall be repaired and replaced at no cost to the Owner.
- C. Furnish manufacturer's additional thirty (30) year warranty agreeing to repair and/or replace Suspension material that has had an occurrence of 50% or more of Red Rust as defined by ASTM test procedure work and has failed as a result of defects in materials or workmanship.
 1. Upon notification of Owner within the warranty period, such defects shall be repaired and replaced at no cost to the Owner.
- D. Furnish manufacturer's additional thirty (30) year warranty agreeing to repair and/or replace lay in panels which show visible sag as a result of defects in materials or workmanship.
 1. Upon notification of Owner within the warranty period, such defects shall be repaired and replaced at no cost to the Owner.
- E. Furnish manufacturer's additional individual product **ten (10)** year warranty agreeing to repair and/or replace lay in panels which have failed as a result of defects in materials or workmanship.
 1. Upon notification of Owner within the warranty period, such defects shall be repaired and replaced at no cost to the Owner.
- F. Furnish manufacturer's additional thirty (30) year system warranty agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.

1. Upon notification of Owner within the warranty period, such defects shall be repaired and replaced at no cost to the Owner.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to, the following:
 1. Overhead Construction
 2. Wall Construction
 3. All Recessed/Attached Components, including, but not limited to:
 - a. Sprinkler Heads
 - b. Lighting – recessed and suspended
 - c. Low Voltage Devices
 - d. HVAC grills/diffusers
 - e. Speakers
 - f. Security camera's
 - g. Floor or roof structure above
 - h. Wall framing and finish
 - i. Wall backing
 - j. Ceiling framing
- B. Related Sections include, but are not limited to the following:
 1. Division 1
 2. Section 09 29 00 – Gypsum Board & Sheathing Substrates

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with General Contractor.
- B. Schedule required testing, prior to the installation of materials, components, etc.

1.13 EXTRA MATERIALS

- A. Submit as part of project closeout:
 1. Provide extra material for each product type, color, finish, etc. in same lot as installed product.
 - a. Furnish written certification that extra materials supplied have been inspected and reconfirmed to be the same as those used in the Work.
 2. Provide extra material in unopened fully labeled containers.

- a. Do not supply anything less than the full carton containers.
 - b. Furnish in factory packaged and labeled cartons and identify cartons with Project name.
 - c. Deliver materials to project premises just prior to substantial completion, and store at location directed by the Owner.
3. Provide the following
 - a. 5% of total panels installed for each type

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturer shall be one of the following and as herein listed and in Drawings:
 1. Acoustical Tile & Standard Grid:
 - a. DONN/USG Interiors, Inc. www.usg.com
 - b. Armstrong www.armstrong.com
 - c. Linder, www.linderusa.com
 2. Accessories:
 - a. Flannery, Inc., www.flannerytrim.com
 3. Fasteners:
 - a. I-LAG Brand Screws
 - b. Approved equivalent that meets ESR report herein listed
 4. Reviewed Equivalent by Architect.
 - a. Substitutions and deviations shall require Architect's approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. Acoustical Tiles:
 1. Schedule:
 - a. Type: **AC1** (Refer to Drawings)

- 1) Mfgr: CertainTeed
- 2) Type: Symphony m85 High NRC
- 3) Material: Mineral Fiber
- 4) Edges:
 - a) Squared
- 5) Model: Medium Fine Texture
- 6) Color: White
- 7) Standards:
 - a) Fire Rating: No
 - b) NRC: .85
 - c) Light Reflect: 90%
 - d) CAC: 35
 - e) R Factor:
 - i. 1.5 (BTU units)
 - ii. 0.26 (WATTS units)
 - f) Classifications:
 - i. Type III (ASTM E1264)
- 8) Item No. 1264
- 9) Size: 24" x 48" x 3/4"
- 10) Features:
 - a) Recycled Content: 32-53 %
- 11) Warranty: 30 year system
- 12) Grid Options: 15/16"
- 13) Approvals:
 - a) USDA/FSIS guidelines for use in Food processing areas

B. Suspended Grid Systems:

1. General:
 - a. Type:
 - 1) Restrained system
 - 2) Direct suspension, supported and braced by connections to overhead structures.
 - 3) Heavy-duty, meeting requirements Building Code Standards, and as specified.
 - b. Components:

- 1) Factory fabricated, punched, and otherwise prepared to facilitate rapid installation with minimum Field Work for typical conditions.
 - 2) Items of like type and size shall be readily interchangeable without modifications.
 - c. Grid Runners:
 - 1) Type: Double-web section type, formed from steel strip in thickness required to meet heavy-duty classification.
 - d. Exposed-grid Accessories:
 - 1) Perimeter angles molding, reveals, and other items detailed; roll formed from electro galvanized steel strip to sizes indicated or required for Project conditions, and as accepted.
 - 2) For fixed connection of runner ends to wall angels, 1/8-inch-diameter steel pop rivets, color matched to grid system.
 - 3) Finish exposed components to meet requirements specified for grid system with which used.
 - e. Panel Hold-Down Clips:
 - 1) Provide for panels less than typical field size, and panels within 20-feet radius of an exterior door.
 - f. Seismic Clips.
 - 1) Mfgr's building code compliant clips.
2. Schedule:
 - a. Standards:
 - 1) Rating: No
 - 2) Type: Heavy Duty
 - 3) Recycled Content: Yes (HRC)
 - b. Finishes:
 - 1) Flat White Standard Painted Metal - Manufacturer's factory finish
 - c. System:
 - 1) Main TEE:
 - a) Manufacturer: DONN (USG)
 - b) Model No: DXL26 HRC
 - c) Size: 15/16" face x 12'-0" long
 - d) Duty: Heavy
 - e) Recycled Content: 65% Total (57% PC)
 - 2) Cross TEE:

- a) Manufacturer: DONN (USG)
- b)

<u>Model No:</u>	<u>Length:</u>	<u>Height:</u>	<u>Recycled Content:</u>
i. DXL216HRC2'-0"		1"	65% total (57% PC)
ii. DXL426HRC4'-0"		1-1/2"	65% total (57% PC)
iii. DXL524	5'-0"	1-1/2"	up to 47%(up to 39% PC)
iv. Face Size:	Match Main Tee		

d. Accessories:

1) Including, but not limited to;

a) Perimeter wall angles & accessories:

- i. Wall angle:
- a. Mfgr: DONN (USG)
- b. Type: Wall Moldings
- c. Horizontal leg: 7/8"
- d. Model: M7

ii. Seismic Clip – Floating side

- a. Mfgr: DONN (USG)
- b. Model: A7

iii. Seismic Clip – 4 way

- a. Mfgr: DONN (USG)
- b. Model: DH4

iv. Light Fixture Clip

- a. Mfgr: DONN (USG)
- b. Model: LFC

v. Compression Posts

- a. Mfgr: DONN (USG)
- b.

<u>Model:</u>	<u>Height/Span:</u>
i). VSA 18/30	18" to 30"
ii). VSA 30/48	30" to 48"
iii). VSA 48/84	48" to 84"
iv). VSA 84/102	84" to 102"
v). Per drawing details	Over 102"

C. Suspension Materials & Fastenings:

1. General:
 - a. Comply with requirements of building code
 - b. Comply with standards as herein specified
 - c. Comply with mfg'r's standards
2. Wire:
 - a. General: ASTM A641, galvanized steel, regular coating soft temper; factory prestraightened units.
 - b. Hanger and Safety Wires: 12 gauge.
 - c. Ceiling and Partition Bracing Wires: 10 gauge
3. Turnbuckles: As required for leveling grid assemblies, of adequate size, electroplated.
4. Fastenings for Accessories:
 - a. General:
 - 1) Bolts or screws of adequate size, in type appropriate for conditions and materials involved, and made corrosion-resistant materials or coated as accepted.
 - 2) Concealed only, unless otherwise indicated or accepted.
 - b. I Lag Screws:
 - 1) Mfg'r: I-LAG Brand Screws or approved equivalent
 - 2) Model:
 - a) Metal framing: 750 SD
 - b) Wood framing: 150 SD
 - 3) Type: Self Tapping
 - 4) Length:
 - a) 750 SD: 2"
 - b) 150 SD: 2 – ¾"
 - 5) Material: Galvanized 1018 steel
 - 6) Heat treated: Yes
 - 7) Wire attachment hole: Round
 - 8) Approvals: ICC ESR-5367
- D. Accessories:
 1. Partition Mold
 - a. Application: Wall to ceiling transition where grid continues over the top of the wall
 - b. Mfg'r: Flannery, Inc., www.flannerytrim.com
 - c. Product: TPAM – 300

- E. Ceiling Access Hatch – *Not Used*
- F. Miscellaneous Products
 - 1. Perimeter Trim:
 - a. Steel channel type trim, color keyed to grid system.
 - b. White color closely keyed to tile color.
 - c. Required for each installation area, unless otherwise indicated.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the General Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed.
 - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.
- B. Surface:
 - 1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.
- B. Field dimensions must be verified prior to installation.

3.4 MOCK-UP

- A. Erect at location approved by Architect.
 - 1. Mock-up shall not be part of final construction once approved by Architect.
 - 2. Mock-up shall comprise of all components and finishes as specified and indicated in Drawings.
- B. Mock-up
 - 1. Size: One corner of a ceiling with 6 panels, min.

3.5 INSTALLATION

- A. General:

1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 2. Except as modified by this Section, install suspension system and acoustical tiles in accordance with manufacturer's instruction.
 3. Layout acoustical ceilings to provide symmetrical borders not less than half the size of the tile or panel specified.
 4. Install suspension systems and tile so that tile joints are aligned, perpendicular and parallel to room or space in which they are installed as indicated in the drawings. Install tiles with pattern runner in one direction.
 5. Install the work of this Section so that completed ceilings will be level within 1/8" in 12 ft. of the ceiling line. Printed instructions; comply with governing regulations, requirements as indicated, and industry standards applicable work.
- B. Standard reference:
1. Install ceiling panels and suspension system, including necessary hangers, grillage, splines, and other supporting hardware, in accordance with ASTM C636, CISCA Installation Stds., (UL Design) and any applicable code requirements.
- C. Manufacturer's reference:
1. Install ceiling panels in exposed grid systems, supported on all edges, in accordance with manufacturer's current printed recommendations and in compliance with code and agency criteria.
- D. Drawing reference:
1. Install ceiling panels in accordance with approved shop drawings and manufacturer's requirements.
- E. Installation of Suspension System:
1. 12 ga. (min.) Hanger wires may be used for up to and including 4'-0" x 4'-0" grid spacing. Splices will not be permitted in any hanger wires.
 2. Provide hanger wires within 8" of the ends of all main and cross runners or at 1/4 of the length of the end tee, whichever is least at the perimeter of the ceiling area.
 3. Provide trapeze or other supplementary support members at obstructions to maintain hanger spacing. Provide addition hangers, struts or braces as required at all ceiling breaks, soffits of discontinuous areas. Hanger wires that are more than 1 in 6 out of plumb are to have counterbraced wires.
 4. Ceiling grid members may be attached to not more than 2 adjacent walls.
 - a. Ceiling grid members should be at least 1/2 inch free of other walls.
 - b. If walls run diagonally to ceiling grid system runners, one end of main and cross runners should be free and a minimum of 1/2 inch clear of wall.
 5. At the perimeter of the ceiling area where main or cross runners are not connected to the adjacent wall, provide interconnection between the runners at the free end to prevent lateral

- spreading. Where the perpendicular distance from the wall to the first parallel runner is 12" or less, this interlock is not required.
6. Provide sets of 4-#12 ga. splayed bracing wires oriented 90 degrees from each other and compression strut at the following spacing, and scope:
 - a. Place sets of splay wires with compression strut at a spacing not more than 12 feet by 12 feet on center, and not more than 6 feet from all perimeter walls.
 - b. Provide splay wires at the edge of vertical ceiling offsets.
 - c. The slope of splayed wires should not exceed 45 degrees from the plane of ceiling and should be taut without causing the ceiling to lift. Splices in bracing wires are not permitted.
 7. Fasten hanger wires with not less than 3 tight turns.
 - a. Fasten splay wires with 4 tight turns.
 - b. Make all tight turns within a distance of 1-1/2 inches.
 - c. Hanger or bracing wire anchors to the structure should be installed in such a manner that the direction of the work aligns as closely as possible with the direction of the forces acting on the wire.
 8. Separate all ceiling hanging and bracing wires at least 6 inches from all unbraced ducts, pipes, conduits, etc.
 - a. It is acceptable to attach lightweight items, such as single electrical conduit not exceeding 3/4-inch nominal diameter, to hanger wires using connector acceptable to manufacturer.
 9. Attach all light fixtures to the ceiling grid runners (Or to the floor or roof structure above, in the case of pendent fixtures) to resist a horizontal force equal to the weight of the fixtures.
 10. Flush or recessed light fixtures and air terminals or services weighing less than 56 pounds may be supported directly on the runners of a heavy duty grid system but, in addition, they must have a minimum of 2 - #12 ga. slack safety wires attached for diagonal corners and anchored to the structure above.
 - a. All 4 ft. x 4 ft. light fixtures must have slack safety wires at each corner.
 11. All flush or recessed light fixtures and air terminals or services weighing more than 56 pounds must be independently supported by not less than 4 #12 ga. taut wires attached to the structure above regardless of the type of ceiling grid system used.
 - a. The 4 taut #12 ga. wires including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.
 12. Support surface mounted light fixtures by at least two positive devices which surround the ceiling runner and which are supported from the structure above by a #12 ga. wire.
 - a. Spring clips or clamps that connect only to the runner are not acceptable.
 13. Support pendant mounted light fixtures directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting 4 times the weight of the fixtures.

F. Installation of Acoustical Tile:

1. All cut edges of tile shall meet the following criteria;
 - a. Cut new Tegular edge to match existing at Tegular tile.
 - b. Paint edges of exposed cut tile with factory paint to match tile color.

G. Radius Components

1. General
 - a. Attach the wall angle to the wall through metal hanger strap to insure a snug fit.
2. Outside Radius Installation
 - a. A heat gun is required for outside radius installations.
 - b. Attach one end of wall angle to wall with any standard fastener system, including industrial adhesives.
 - 1) However, if adhesives are used, a mechanical fastener must also be used.
 - c. Continue to 'walk' down the wall with any standard fastener, every 1 – 3" (depending on the radius) until entire wall angle section is installed.
 - d. To size length of wall angle, install as instructed above until the radius ends. Take a utility knife and SCORE the wall angle where you want the radius to run. Break the wall angle at the scored lines.
3. Inside Radius Installation
 - a. In order for the following process to work, the wall angle must be installed prior to using the heat gun.
 - b. Place wall angle along the area where it will be installed, without attaching the wall angle permanently.
 - a. Place the first permanent fastener in the center of the wall angle.
 - c. Install the next fastener 1 – 3" (distance depends on the radius) to the right, then the next fastener 1 – 3" to the left of center, and continue to alternate fasteners so that there is a snug fit against the wall. A snug fit against the wall is critical on inside radius applications.
 - 1) At this point lay in ceiling tiles to expedite the shrinking process.
 - d. Using a heat gun (not a hair dryer) start at one end of the installation and apply heat in a 'stroking' motion towards the opposite end of the wall angle.
 - 1) Do not apply heat from the center outward.

3.6 MAINTENANCE

- A. Cleaning: Panels can be cleaned easily with a soft brush, vacuum, or dry chemical sponge.
- B. Repainting:
 1. Spray a thinned, non-bridging vinyl-acrylic flat wall paint.
 - a. The type of paint selected and the method of application can alter the acoustical performance and fire ratings of any acoustical product.

2. Clean exposed surface of acoustical ceilings, including trim, edge moldings and suspension member; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage.
 - a. Remove and replace work, which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.7 ADJUSTING

- A. Adjust any sags or twists, which develop in ceiling systems, and replace any part, which is damaged or faulty.

3.8 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 1. General Contractor
 2. and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 3. The Applicator shall be responsible for the proper application of the materials.
- A. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.9 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no cost to the Owner.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the Architect after he receives the General Contractor's NOTICE of "Certificate of Substantial Completion".

END OF SECTION 09 51 00

SECTION 06 65 13 – RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Moldings

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. Aluminum Association (AA), www.aluminum.org
- E. American Society For Testing and Materials (ASTM), www.astm.org
 - 1. ASTM C 1028 – Evaluating the Static Coefficient of Friction of Ceramic Tile and Other Like
 - 2. ASTM E 648 – Standard test method for critical radiant flux of floor covering systems using a radiant heat source
- F. Ceramic Tile Institute (TCI), www.ctioa.org
 - 1. Handbook for Ceramic Tile Installation
- G. International Code Council (ICC), www.iccsafe.org
- H. National Sanitation Foundation (NSF), www.nsf.org
- I. Occupational Safety and Health Administration (OSHA), www.osha.gov

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. **General:**
 - 1. Comply with manufacturer's standards.

2. Comply with Building Code.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Installed Moldings	Accessible, change in level	Are accessible	ADA, Section 4.5.2 (Change in Level) & Section 4.5.3 (Carpet-Edge Trim Compliance)
Moldings	Flammability	Class 1, FS = 110 SDD = 870 Fuel Contribution = 55	ASTM E 648
Moldings	Fire Rating	Class 1	ASTM E 648
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.
 1. Primers
 2. Cut sheet of each product type with color selections
 3. Adhesive for each product type
- E. Submit samples.
 1. Of each product type x 6" long
- F. Site mock-up, refer to "Mock-Up" heading.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing / installing / finishing similar size projects and complexity.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.
- D. Lead Times:

1. **General Contractor** shall coordinate with supplier to verify product lead times during bids and at award of contract, and account for such lead times in their costs and schedules.
 2. **General Contractor** shall provide an itemized list of materials which might have or are confirmed to have a lead time problem and what the anticipated lead time is.
 3. **General Contractor** shall certify in writing that all materials have acceptable lead times as they relate to availability for sub-contractor and **General Contractor** to meet construction schedule and sequence of construction.
- E. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid
- F. Stipulations:
1. Products shall be approved for each application
- G. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
1. Agenda for meeting shall include, but not be limited to;
 - a. Various heights of finish flooring and compliance with accessibility criteria related to slopes, changes in heights, etc.
 2. **General Contractor** shall request meeting 5 days in advance of construction.
- H. Miscellaneous criteria:
1. Installation of transition trim, moldings, etc. shall not be installed until shop drawing of layout is reviewed.
- I. Miscellaneous criteria:
1. Installation of transition trim, moldings, etc. shall not be installed until shop drawing of layout is reviewed.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional two (2) year warranty agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship for all moldings.
 - 1. Upon notification of Owner within the warranty period, such defects shall be repaired and replaced at no cost to the Owner.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Substrate
 - 2. Finish Flooring
 - 3. Finish Base
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 03 30 00 – Cast-in-Place Concrete
 - 3. Section 03 00 61 – Concrete Floor Leveling, Patching and Grouting
 - 4. Section 07 26 00 – Concrete Slab Vapor Emission Control Treatment
- C. Related Documents include, but are not limited to the following:
 - 1. Division 1 Supplementary Conditions

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. Schedule slab vapor emission and PH testing of concrete floors prior to the installation of finish flooring.

1.13 EXTRA MATERIAL

- A. Submit as part of project closeout:
 - 1. Provide extra material for each product type, color, finish, etc. in same lot as installed product.
 - a. Furnish written certification that extra materials supplied have been inspected and reconfirmed to be the same as those used in the Work.
 - 2. Provide extra material in unopened fully labeled containers
 - a. Do not supply anything less the full carton containers.
 - b. Furnish in factory packaged and labeled cartons and identify cartons with Project name.
 - c. Deliver materials to project premises just prior to substantial completion, and store at location directed by the **Owner**.
 - 3. Provide the following (Include paint name, drawing designation, type and sheen)
 - a. Four (4) 12'-0" lengths of each molding type & color.

1.14 VAPOR EMISSION AND ALKALINITY CONTROL COMPLIANCE

- A. Refer to Section 07 26 00 – Concrete Slab Vapor Emission and Alkalinity Control Treatment

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturer shall be one of the following and as herein listed and in Drawings:
 - 1. Roppe Corporation, Roppe Holding Company
 - 2. BurkeMercer, www.burkemerger.com
 - 3. Johnsonite, www.johnsonite.com
 - 4. Loxscreen Flooring Group, Bengard line, www.loxscreenflooring.com
 - 5. BENGARD, www.dura-trim.com
 - 6. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. 4" Rubber Coved Base – No Substitutions

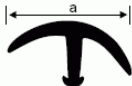
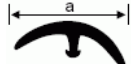
1. Mfgr: Roppe Corporation
2. Material: 100% First Quality Homopolymer Vinyl, U.N.O.
3. Color: 169 Hunter Green

B. Transitions

1. Mfgr: Burke Mercer, www.burkemercer.com
2. Material: 100% First Quality Homopolymer Vinyl, U.N.O.
3. Color: As selected by **Architect** for each condition from manufacturer's full line of colors

1) Carpet to Carpet:

a) Carpet to carpet

Item	Use / Description	Material	Detail
1 Piece Molding			
150 Tile-Carpet Joiner	One-piece molding. Joins 1/4" carpet to 1/8" carpet.		
2 Piece Assembly – Not Used			
365 Cerco Edge T	Joins 1/2" carpet to lesser-carpet thickness. Use 970, 980, and 990 track. Use 975 extender when necessary	Vinyl Aluminum	
940 Standard Edge T	Joins 1/4" carpet to lesser carpet thickness. 1-1/8" wide, 1/4" leg. Use 970, 980, and 990 track. Use 975 extender when necessary	Vinyl Aluminum	
Note: Track Options: see 2 piece Assembly			

C. Mat Edge Moldings:

1. Schedule:
 - a. Mfgr: BurkeMercer, www.burkemercer.com
 - b. Color: As selected by **Architect** for each condition from manufacturer's full line of colors.
 - c. Product:

Item	Use	Detail
220 Mat Edging	Flexible vinyl for protecting edges of floor mats 3/32" butt edge. 1" transition width. Carpet and Resilient	

D. Threshold Saddle Moldings – Not Used

E. Cove Supports – Not Used

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

B. Adhesive and Fillers

1. Mfgr: BurkeMercer, www.burkemercer.com

2. Schedule:

a. Moldings

1) As recommended by manufacturer for material and substrate.

C. Sealant

1. Mfgr: BurkeMercer, www.burkemercer.com

2. Applications: Touch-up / Filler for minimal gaps & irregularities.

3. Model: Color Caulk

4. Color: To match molding color

D. Accessories

1. Mfgr: BurkeMercer, www.burkemercer.com

2. Schedule:

a. Vinyl Track Extenders

b. Model: 975

PART 3 - EXECUTION

3.1 INSPECTION/EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.

2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

A. Refer to Division 1 for project coordination requirements.

- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

- A. General:
 - 1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.

3.5 MAINTENANCE

- A. Product shall be installed, cleaned and sealed as herein specified and in accordance with each specific flooring manufacturers recommendations to maintain the following of their installed product, but not limited to;
 - 1. Slip Resistance
 - 2. Slip Resistance Coefficient of Friction of 0.6.
 - 3. Warrantee requirements
- B. Product shall be maintained by **Owner** after occupancy to maintain the Slip Resistance and coefficient of friction rating.
- C. Refer also to PROTECTION AND CLEAN UP heading.

3.6 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 - 1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 - 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.
- C. The sealant applicator shall certify in writing that the sealant application is in accordance with the sealant manufacturer's recommendations

3.7 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.

- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 09 65 13

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section deals with resilient flooring found in the drawings and schedules of the contract that meet the requirements of this section.

1.2 RELATED SECTIONS

- A. Section 3 – Cement: not covered in this section.
- B. Section 6 – Wood and plastic: not covered in this section.
- C. Section 7 – Thermal and humidity protection: not covered in this section.
- D. Section 9 – Other sections containing information related to floor finishes: not covered in this section.

1.3 REFERENCES (INDUSTRY STANDARDS)

- A. ASTM F 710: Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- B. ASTM E 648: Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
- C. ASTM E 662: Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- D. ASTM F 1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. ASTM F 2170: Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.

1.4 ITEMS TO DELIVER

- A. Provide the product's Technical Specifications data sheet as well as all installation and maintenance instructions.
- B. When required, supply floor drawings and installation plans.
- C. Supply a set of samples measuring at least 3 in. (7.5 cm) by 6 in. (15 cm) of the complete range of colors and finishes chosen for the project.
- D. When required, provide Manufacturer's attestation, certified by an independent laboratory, confirming that the flooring complies with the fire standards of the following tests:
 - 1. ASTM E 648; Critical Radiant Flux: 0.45 watts/cm² or more.
 - 2. ASTM E 662; Smoke Density: 450 or less.
- E. Provide Manufacturer's Warranty Certificate.

1.5 QUALITY ASSURANCE

- A. Have flooring installed by an installer qualified in the installation of resilient flooring.
- B. In accordance with the installation instructions, use all accessories recommended by Manufacturer when installing its flooring.
- C. Follow the instructions specified in the most recent version of Manufacturer's installation instructions.

1.6 DELIVERY, HANDLING, STORAGE

- A. Deliver the flooring to the installation site in Shaw Contract's original packaging. Indicate the project name and handling instructions on the outside of the boxes.
- B. Advise the carrier of any damaged material and indicate it on the packing slip.
- C. Store the flooring inside, sheltered from extreme hot or cold temperatures. Place the material on a smooth level floor or where there is uniform solid support in a clean, dry, well-ventilated area. The long-term storage temperature must be maintained between 65°F (18°C) and 85°F (29°C). Protect adhesive and flooring material from freezing, extreme heat and direct sun exposure.

- D. Acclimate the subfloor, all flooring material and adhesive for 48 hours before, during and after the installation by maintaining the room temperature between 65°F (18°C) and 85°F (29°C). The pallets should be unstacked 24 hours prior to use.
- E. Afterwards, maintain the room temperature between 65°F (18°C) and 85°F (29°C). Protect the material from direct sources of heat such as air vents and other types of heaters.
- F. Install the flooring after all other finishing work, including painting, has been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Shaw Contract, 160 S. Industrial Blvd, Calhoun GA 30701 Telephone 800.241.4494.
Website: [Commercial Flooring Solutions | ShawContract](#)
Contact:
- B. Substitutions or Equals:
 - 1. Substitutions are allowed only if they meet the following criteria:
 - a. Acceptance of alternate product(s) that are accepted as equals must be approved by parties (including, but not limited to) that have material interest in the specifications including: Designer, Architect, End-User, and Flooring Contractor.

2.2 MATERIALS

A. DETAILED PRODUCT CONSTRUCTION SPECIFICATIONS

Style Name	Joy Squared – 0993V
Collection	Joy Squared
Product Type	Direct Glue LVT
Overall Thickness	2.5 mm (0.098")
Wear Layer	20 mil (0.02 mm)

Finish	ExoGuard+ ®
Size	24" x 24" or 12" x 24"
Square Feet Per Carton	68 sf/ctn
Pounds Per Carton	57.79 lbs/ctn
Installation Method	Direct Glue

Recommended Installation Methods

Brick or Ashlar

Sustainability

Floor Score Floor Score Certified

Country of Origin USA

Environmental Product Declaration 3rd Party Certified in Accordance with ISO 14025, EN 15804, & ISO 21930:2017

Class III, Type B

- B. Refer to the product's Technical Specifications data sheet for detailed specifications.
- C. Choose from any of ShawContract's complete line of 24 colors
- D. All specifications are subject to normal manufacturing tolerances

2.3 ADHESIVE

- A. Shaw Contract requires the use of the following adhesives to maintain the product warranty:
 - 1. S150-95 Resilient Tile Spray
 - 2. 4200 Resilient Tile 4 Gallon
 - 3. 4151 Multi-Use Premium 4 Gallon

2.4 OTHER MATERIAL

- A. Subfloor repairs: use a good-quality Portland cement-based compound modified with latex that has a minimal resistance to compression of 3500 lbs/sq. in. (246 kg/cm²). to fill, smooth and/or level subfloor imperfections.
- B. Self-levelling underlayment: use a Portland cement-based self-levelling underlayment modified with a polymer that has a minimal resistance to compression of 3500 lbs/sq. in. (246 kg/cm²).

PART 3 - EXECUTION

3.1 SITE INSPECTION

- A. Examine the subfloor before installation to ensure that the surface is clean, dry, smooth, structurally sound and free from foreign substances that may adversely affect adhesion or cause discoloration. Furthermore, ensure that the subfloor is free of paint, varnish, adhesive, oil, grease, solvent and other foreign substances, including treatment compounds, sealers and curing compounds that may adversely affect adhesion or alter the appearance or durability of the resilient flooring.
- B. Verify the surface to ensure there is no powder, scaling or mold. If found remove with a mechanical sander and level with a good-quality Portland cement-based self-levelling underlayment modified with a polymer that has a minimal resistance to compression of 3500 lbs/sq. in. (246 kg/cm²).
- C. Slabs that have been either using a curing agent or a sealer will have to be treated to ensure that the adhesion has not been impaired.
- D. Do not install on cement slabs that have been subjected to adhesive chemical abatement unless an approved remediation system was used afterwards.
- E. Report and rectify all unsatisfactory conditions. Do not start flooring installation until all rectifications have been completed.

3.2 SUBFLOOR PREPARATION

- A. Level all rough surfaces and fill cracks and marks with a Portland cement-based patching compound modified with latex.

- B. Mechanically remove all surface contaminants such as paint, oil, grease, varnish, adhesive as well as various other products such as treatment compounds.
- C. Measure the humidity and pH levels in the cement in compliance with the following standards before installation:
 - 1. ASTM F 2170, Relative Humidity (RH) test using in situ probes.
 - 2. ASTM F 710, pH levels (test procedure 5.3.1).
 - 3. The ASTM test frequency recommendation is 3 measures for the first 1,000 sq. ft. (92.9 sq. m) and one measure for each additional 1,000 sq. ft. (92.9 sq. m).
- D. Ensure Moisture, Relative Humidity and pH tests have all been conducted and measurements meet manufacturer's recommendations.
- E. In case of doubt, test the adhesion on the cement subfloor or other surface that will be covered by the flooring. Do the test using the specified flooring and recommended adhesive.

3.3 RESILIENT FLOORING INSTALLATION

- A. Install the flooring according to the latest version of Shaw Contract's installation instructions. Use the tools, adhesives, trowel types and procedures recommended in the instructions.
- B. Acclimate the subfloor, all flooring material and adhesive for 48 hours before, during and after the installation by maintaining the room temperature between 65°F (18°C) and 85°F (29°C). Afterwards, maintain the temperature between 65°F (18°C) and 85°F (29°C).

3.4 CLEANING AND PROTECTION

- A. Remove all excess adhesive immediately after installation as recommended in Shaw Contract's installation instructions.
- B. Before allowing traffic after installation, consult and follow the recommendations in Shaw Contract's installation instructions.
- C. Following installation and cleanup, if the work of all other trades has not yet been completed, protect the flooring by laying sheets of non-staining brown Kraft paper and then a layer of plywood sheets (rolls of non-staining heavy cardboard material could also be used for protection).

- D. Follow the instructions in ShawContract's Maintenance Instructions when performing initial and regular maintenance procedures.
- E. Please note that technical website documents prevail.

END OF SECTION 09 65 19

SECTION 09 67 00 – EPOXY FLOOR COATING

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Epoxy resin, slip resistant floor and base assembly with broadcast colored quartz top layer.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC), www.bsc.ca.gov current edition at time of permit issuance.
- B. Title 24, California Code of Regulations, California Building Standards Commission
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. CBC Energy Code, California Code of Regulations, Title 24, Part 6
- E. American Society for Testing and Materials (ASTM):
 - 1. ASTM C 1028 Evaluating the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces
 - 2. ASTM E648-88 Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source.
 - 3. ASTM E662-83 Test Method for Specific Density of Smoke Generated by Solid Materials.
 - 4. ASTM F710-86 Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
 - 5. ASTM F970-87 Test Method for Static Load Limit.
 - 6. ASTM F1869m-98 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride"
 - 7. ASTM E1643-98 "Standard Practice for Installation of Water Vapor Retarders Used in Concrete with Earth or Granular Fill Under Concrete Slabs"
- F. Federal Specification (Fed Spec):
 - 1. Fed Spec L-F-475A Floor Covering, Vinyl, Surface (Tile and Roll), with Backing, February 1971.
- G. International Code Council Evaluation Service (ICC-ES), www.icc-es.org
- H. National Fire Protection Association (NFPA):
 - 1. NFPA 253-1984 Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source.
 - 2. NFPA 258-1989 Test Method for Specific Density of Smoke Generated by Solid Materials.

- I. National Sanitation Foundation (NSF), www.nsf.org
- J. United States Department of Agriculture (USDA), www.usda.gov
- K. United States Food and Drug Administration (FDA), www.fda.gov

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Concrete Substrate	Cured substrate	28 days at minimum	Mfgr
	Strength	3000 p;si, min.	
	Texture	Roughened up / broom or other as approved by mfgr.	
	Vapor Emissions	3 lbs/1,000 SF/24 hrs	Mfgr. and refer to Section 07260 – Concrete Slab Vapor Emission And Alkalinity Control Treatment
Primer (Dur-a-Glaze #4)	Percent Solids	100%	Mfgr
	VOC	4 g/L	
	Bond Strength to Concrete	400 psi, substrate fails	ASTM D 4541
	Hardness	80	ASTM D 2134
	Compressive Strength	11,200 psi	ASTM D 695
	Flexural Strength	5,100 psi	ASTM D 790
	Tensile Strength	2,100 psi	ASTM D 638
	Abrasion Resistance CS 17 wheel, 1,000 g Load	29 mg loss	ASTM D 4060
Epoxy material (Broadcast, grout coat and topcoat)	Percent Solid	100%	Mfgr
	VOC	8.5 g/L	Mfgr
	Compressive Strength	14,000 psi	ASTM C 579
	Tensile Strength	2,500 psi	ASTM D 307
	Flexural Strength	5,500 psi	ASTM D 580
	Flexural Modulus of Elasticity	1.9 x 10 ⁶ psi	ASTM D 790
	Abrasion Resistance	65 mg loss (C-10 wheel, 1,000 gm load, 1,000 cycles)	ASTM D 4060
	Flammability	Self Extinguishing	ASTM D 635
	Indentation	No Indentation	MIL D-3134-F

	Water Absorption	0.05%	ASTM D 570
	Thickness	1/8" – 1/9"	Mfgr
System	Use in Food Preparation Areas	Comply	USDA, FDA, & Local Health Dept.
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

D. Construction Testing:

Item	Name of Test	Performance Results	Testing Std.
Concrete Substrate	Vapor Emissions	Comply	Refer to Section 07260
	PH Levels		
Air	Dew Point	As herein indicated	As herein indicated
	Temperature		
Substrate			
Epoxy Flooring	Thickness	1/8" – 1/4" Rates for all layers shall be monitored by checking quantity of material used against the area covered	Mfgr.
Water Vapor Emissions per mfgr's recommendations and acceptance of existing substrate			

E. Construction Testing / Inspection by others:

Item	Name of Test	Performance Results	By Whom
Flooring	Preparation/Installation	Comply	Mfgr's Representative

F. Construction Monitoring/Observations by others:

Item	Name of Test	Performance Results	By Whom
Epoxy Materials	Const. Waste Management	Comply	Refer to Division 1 for construction waste management and disposal/recycling requirements

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Submit Manufacturer's data and shop drawings.
 1. Floor coating
 2. Primers

3. Current product literature and installation.
4. Layout shop drawings with all joints and transitions called out and detailed
- E. Submit samples.
 1. 6" x 6" samples of specified deck coating system, reflecting assembly, color & texture.
 - a. Samples shall be construed as examples of finished color and texture of deck coating system only.
- F. Site mock-up, refer to "Mock-Up" heading.
- G. Certification:
 1. Submit a currently dated Applicator License Certificate issued by the supplier and approved by product mfr.
 - a. The certificated shall verify the applicator's qualifications to properly install the deck system, and shall commit the supplier to the acceptance of the applicator as a co-signer under the joint responsibility provisions of the guarantee required by these specifications.
- H. Miscellaneous criteria:
 1. Adhesion of new flooring material under this section which is applied over existing substrates which may or may not have had previously applied flooring
 - a. Primer shall be applied over existing substrate as needed to fully adhere new material and meet all warranty criteria.
 - b. Adhesion testing shall be done to confirm compatibility of assembly

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing / installing / finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for **ten (10)** years providing/installing/finishing projects of similar size and complexity.
- D. Stipulations:
 1. Meet emission criteria.
- E. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 1. Agenda for meeting shall include, but not be limited to;
 - a. Substrate vapor emissions and alkalinity levels
 - b. Substrate preparation, treatment and acceptance
 - c. Transitions to dissimilar materials
 2. **General Contractor** shall request meeting 5 days in advance of construction.
- F. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation work to review installation procedures.

1. Manufacturer's representative shall review and certify in writing all phases of construction to verify the complete work meets specification requirements.
2. Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.

G. Miscellaneous criteria:

1. Adhesion of new flooring material under this section which is applied over existing substrates which may or may not have had previously applied flooring.
 - a. Primer shall be applied over existing substrate as needed to fully adhere new material and meet all warranty criteria.
 - b. Adhesion testing shall be done to confirm compatibility of assembly
2. Cure flooring material in compliance with manufacturer's direction, taking care to prevent their contamination during stages of application and prior to completion of the curing process.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Materials shall be delivered in original sealed container, clearly marked with supplier's name, brand name, and type of material.
- C. Contractor shall provide Applicator with a storage area for all components.
 1. The area shall be between 60°F and 90°F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
- D. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

1.7 JOB CONDITIONS

- A. Field-verify that all components, substrates, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
- B. Environmental Conditions:
 1. Application may proceed while air, material and substrate temperatures are between 60°F and 90°F providing the substrate temperature is above the dew point.
 - a. Outside of this range, the Manufacturer shall be consulted.
 2. The relative humidity in the specific location of the application shall be less than 85% and the surface temperature shall be at least 5°F above the dew point.
 3. The Applicator shall ensure that adequate ventilation is available for the work area.
 4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.
- C. Conditions of concrete to be coated with epoxy material.
 1. Concrete shall be moisture cured for a minimum of 7 days and have fully cured a minimum of twenty eight days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
 2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).

3. Sealers and curing agents should not be used.
4. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

D. Protection:

1. Warn personnel against breathing of vapors and contact of material with skin or eyes.
 - a. In confined areas, workmen shall wear approved chemical-cartridge type masks.
 - b. Wear protective clothing.
2. Keep products away from heat, sparks, and flames.
 - a. Do not allow use of spark producing equipment during application.
 - b. Post "No Smoking" signs.
3. After completion of application, do not allow traffic on coated surfaces until completely cured and in accordance with manufacturer's recommendations.
4. Protect mechanical equipment and other surfaces adjacent to work area from overspray.
 - a. Use drop cloths or masking as required.

E. Safety Requirements

1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
2. No smoking signs shall be posted at the entrances to the work area.
3. Non-related personnel in the work area shall be kept to a minimum.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional **five (5)** year warranty agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- D. Furnish installing contractors additional **five (5)** year warranty agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Substrate material
 - 2. Transitions to dissimilar material
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 02 41 19 – Selective Building Demolition & Protection
 - 3. Section 03 30 00 – Cast in Place Concrete
 - 4. Section 03 00 51 – Concrete Cleaning
 - 5. Section 03 00 61 – Concrete Floor Leveling, Patching & Grouting
 - 6. Section 07 28 00 – Concrete Slab Vapor Emission and Alkalinity Control Treatment
- C. Related Documents include, but are not limited to the following:
 - 1. Division 1 Supplementary Conditions

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
- B. Complete instructions regarding maintenance of the materials, finishes, etc.
- C. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.
- C. **General Contractor** shall coordinate slab vapor emission and PH testing of concrete floors and ensure that concrete treatment within criteria of finish flooring is complete prior to the installation of finish flooring as herein specified.

1.13 VAPOR EMISSION AND ALKALINITY CONTROL COMPLIANCE

- A. Refer to Section 07 28 00 – Concrete Slab Vapor Emission and Alkalinity Control Treatment.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturer shall be one of the following and as listed herein and in Drawings:
 - 1. DUR-A-FLEX, Inc., 95 Goodwin Street, East Hartford, CT 06108, (860) 528-9838, www.dur-a-flex.com
 - 2. STONHARD, (800) 854-0310, www.stonhard.com
 - 3. Diamondstone, (888) 817-8663, www.diamondstoneproducts.com
 - 4. Reviewed Equivalent by **Architect**.

- a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
- b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. Option One:

1. Mfgr: DUR-A-FLEX, Inc.
2. System: Seamless Epoxy Flooring
3. Model: DUR-A-QUARTZ, NOVOLAC Epoxy Broadcast (Q11)
4. System Components:
 - a. Primer: Dur-A-Flax, Inc., Dur-A-Glaze #4 Damp Primer resin and hardener
 - b. Broadcast and Grout Coats: Dur-A-Flex, Inc., Dur-a-Glaze Novolac resin and hardener
 - c. Aggregate: Dur-a-Flex, Inc., Q 11 colored quartz aggregate
 - d. Patch Materials:
 1. Shallow Fill and Patching: Use Dur-A-Flex, Inc., Dur-A-Glaze #4 Cove-Rez
 2. Deep Fill Material (over 1/4"): Use Dur-A-Flex, In.c, Dur-A-Crete
 3. Deep Sloping Material (over 1/4"): Use Dur-A-Flex, In.c, Dur-A-Crete
5. Color:
 1. To be selected by the **Architect** among the standard line options
6. Texture: Slip-Resistant

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
 1. Examine areas and conditions under which work is to be performed.
 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.
 3. With Applicator present, examine substrates, areas and conditions for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.
2. Verify that the work done under other sections meets the following requirements:
 - a. That the concrete deck surface is free of ridges and sharp projection.
 1. If metal forms or decks are used they should be ventilated to permit adequate drying of concrete on exterior exposed deck.
 - b. That damaged areas of the concrete deck be restored to match adjacent areas.
 1. Use 100% solids epoxy and sand for filling and leveling.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.
- B. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
- C. Moisture Testing: Perform anhydrous calcium chloride tests and PH level testing.
 1. Refer to Section 07 28 00 - Concrete Slab Vapor Emission Control Treatment.
 2. Application will proceed only when the vapor/moisture emission rate from the slab is less than and not higher than as herein indicated.
 3. If the vapor drive exceeds 3 lbs/1,000 sf/24 hours then the **Owner** and/or **Engineer** shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.
- D. There shall be no visible moisture present on the surface at the time of application of the system.
 1. Compressed oil-free air and/or a light passing of a propane torch may be used to dry the substrate.
- E. Mechanical surface preparation
 1. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings, hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.
 2. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.

3. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4" key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
 4. Cracks and joints (non-moving) greater than 1/8" wide are to be chiseled or chipped out and repaired per manufacturer's recommendations.
- F. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufacturer's recommendations.

3.4 MOCK-UP

- A. Erect at location approved by **Architect**.
1. Mock-up shall be part of final construction once approved by **Architect**.
 2. Mock-up shall comprise of all components and finishes as specified and indicated in Drawings.
- B. Mock-up
1. Size: 4'-0" x 4'-0"

3.5 INSTALLATION

- A. General:
1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 2. The system shall be applied in six distinct steps as listed below:
 - a. Substrate preparation
 - b. Priming
 - c. First broadcast coat application with first aggregate broadcast
 - d. Second broadcast coat with second aggregate broadcast
 - e. Grout coat application
 - f. Topcoat application
 3. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
 4. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the manufacturer's recommendations.
 5. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the **Architect**.
 6. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.
- B. Details
1. Comply with Manufacturer's standard details for:
 - a. Drains
 - b. Floor
 - c. Piping penetrations
 - d. Multiple penetrations
 - e. Flush base

C. Primer

1. The primer shall consist of a liquid resin and hardener that is mixed at the ratio of 2 parts resin to 1 part hardener per the manufacturer's instructions.
2. The primer shall be applied by flat squeegee and back rolled at the rate of 200 sf/gal to yield a dry film thickness of 8 mils.

D. Broadcast Coat

1. The broadcast coat shall be applied as a double broadcast system as specified by the **Architect**.
2. The broadcast coat shall be comprised of two components, a resin, and a hardener as supplied by the manufacturer and mixed in the ratio of 2 parts resin to 1 part hardener.
3. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
4. The broadcast coat shall be applied over horizontal surfaces using "v" notched squeegee and back rolled at the rate of 90-100 sf/gal.
5. Quartz aggregate shall be broadcast to excess into the wet material at the rate of 0.5 lbs/sf.
6. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.
7. Apply a second coat of resin with a coverage rate of 90-100 sf/gal and broadcast aggregate to excess at the rate of 0.5 lbs/sf.
8. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

E. Grout Coat

1. The grout coat shall be comprised of a liquid resin and a liquid hardener that is mixed in the ratio of 1 part hardener to 2 parts resin and installed per the manufacturer's recommendations.
2. The grout coat shall be squeegee applied and back rolled with a coverage rate of 90-100 sf/gal.

F. Topcoat

1. The topcoat shall be comprised of a liquid resin and a liquid hardener that is mixed in the ratio of 1 part hardener to 2 parts resin and installed per the manufacturer's recommendations.
2. The topcoat shall be squeegee applied and back rolled with a coverage rate of 100-125 sf/gal.
3. The finish floor will have a nominal thickness of 3/16".

3.6 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.
- C. Remove masking. Perform detail cleaning at floor termination, so leave cleanable surface for subsequent work of other sections.

3.7 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- B. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- C. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- D. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- E. After completion of work in this section, remove all erection equipment and implements of service, and debris.

Leave entire area in a neat, clean, acceptable condition.
- F. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- G. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- H. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's** NOTICE of "Certificate of Substantial Completion".

END OF SECTION 09 67 00

SECTION 09 72 16 – VINYL WALL COVERING

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Vinyl Wall Covering.
 - 2. Adhesives and accessories.
 - 3. Trims and reveals

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society for Testing and Material (ASTM)
 - 1. ASTM E84-91A - Test Method for Surface Burning Characteristic of Building Materials
- E. Chemical, Textiles and Film Association (CFFA)
 - 1. CFFA-W-101-B Quality Standard for Textile Coated Wallcovering
- F. Federal Specifications
 - 1. CCC-W-408-A
 - 2. CCC-T-191B
- G. National Fire Protection Agency (NFPA)
 - 1. NFPA 101 and NFPA 225 Life Safety Code
- H. Refer to standards herein listed with specific products/materials.

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. **General:**

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.
4. Testing shall be done as herein specified and as listed in drawings.
5. Refer to Division 1 for additional requirements for DSA projects

B. Standards:

Item	Name of Test	Performance	Testing Std.
Vinyl Wall Covering	Fire Rating	Class "II"	ASTM E84
Vinyl Wall Covering	Flame Spread Smoke developed	65 175-350	UL 723 or ASTM E-84, CBC 803.1.2
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.
- D. Submittals:
 1. Manufacturer Product & Technical Data
 2. Manufacturer MSDS Sheets
 3. Manufacturer Installation Instructions
 4. Shop Drawings
 - a. Elevations and application details for one (1) sample classroom.
 5. Samples
 - a. Three (3) samples of each specified wallcovering including backing.
 6. Certifications:
 - a. Submit manufacturer's certification that approved materials shipped by the manufacturer shall meet or exceed the Physical and Performance standards specified herein.
 - b. Sustainability criteria

- c. Installer / Applicator Qualifications and References
 - d. Manufacturer Certifications
 - e. Manufacturer Test Reports
- E. Mock-up:
 - 1. Erect at location approved by **Architect**.
 - a. Mock-up shall be part of final construction once approved by **Architect**.
 - b. Mock-up shall be comprised of all components and finishes as specified and indicated in Drawings.
 - 2. Size: Three (3) full-width / full-height panels of each patten specified in an area designated by the **Architect**.
 - 3. The test installation area shall be reviewed for conformance to the manufacturer's standard installation instructions, including seams, inside and outside corner wraps and recommended adhesives
 - a. Only the **Architect** shall approve the test installation.
 - b. The **Contractor** shall replace any unsatisfactory panels as directed until the mock-up is accepted by the **Architect**.
 - c. The **Contractor** shall not install specified material beyond the test area prior to the approval of the test area.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer shall have been in business for **five (5)** years. providing/installing/finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- D. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid.
- E. Stipulations:
 - 1. Wall covering shall be installed from same lot.
- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
 - 1. Agenda for meeting shall include, but not be limited to:
 - a. Substrate preparation
 - b. Environmental conditions
 - c. Seaming

2. General Contractor shall request meeting 5 days in advance of construction.
- G. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation work to review installation procedures.
 1. Manufacturer's representative shall review and certify in writing all phases of construction to verify the complete work meets specification requirements.
 2. Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.
- H. Miscellaneous criteria:
 1. Install wall covering in proper direction as directed by wall covering manufacturer.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Coordinate delivery of material with the work of other trades
- C. Deliver and store products suitable wrapped or packaged to protect against damage. Do not remove protective coverings until time of installation.
 1. Protect finish and edges in accordance with panel manufacturer's recommendations.
 2. Store material in accordance with panel manufacturer's recommendations.
 3. Store materials inside a building, under cover and out of the weather in accordance with the Manufacturer's written instructions.
 4. Handle materials to prevent damage to the finished surfaces.
- D. Furnish and lay drop cloths in all areas where Wall Covering is to be applied to protect floors and other work from damage.
- E. Protect this work and adjacent materials from damage and be responsible for such damage.

1.7 JOB CONDITIONS

- A. Field verify that all components, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
- B. Do not install materials unless ambient temperatures as herein specified are maintained for required duration.
- C. Do not apply under conditions which jeopardize quality or appearance of finished installation.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional **ten (10)** year warranty agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK / SECTIONS

- A. Related work includes, but is not limited to, the following:
 - 1. Wall Substrate
 - 2. Transitions to dissimilar materials
 - 3. Wall openings
 - 4. Inside and outside corners
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 09 29 00 – Gypsum Board & Gypsum Sheathing Substrates

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 EXTRA MATERIAL

- A. Submit as part of project closeout:
 - 1. Provide extra material for each product type, color, finish, etc. in same lot as installed product.
 - a. Furnish written certification that extra materials supplied have been inspected and reconfirmed to be the same as those used in the Work.
 - 2. Provide the following:
 - a. Provide 10 yards of additional material of each color and type of textile wall covering installed.
 - 1) Provide extra material in unopened fully labeled containers.

- 2) Do not supply anything less than the full carton containers.
- 3) Furnish in factory packaged and labeled cartons and identify cartons with Project Name, wall covering name, drawing designation, type, etc.
- 4) Deliver materials to project premises just prior to substantial completion, and store at location directed by the **Owner**.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturer shall be one of the following and as listed herein and in Drawings:
 1. Wall Covering:
 - a. Chatfield-Clarke Co. – No Substitutions
 2. Adhesives:
 - a. H.B. Fuller
 3. Trims and reveals
 - a. Fry Reglet
 - b. Plastic moldings wrapped to match
 4. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

- A. General:
 1. Vinyl Wallcovering shall be supported material consisting of a pigmented mildew inhibited polyvinyl chloride, free of mercury and cadmium, surfaced with a protective acrylic top coating and adhered to a vinyl backing.
 2. All materials shall conform to the CFFA-W-101-B Physical and Performance Standards and using test methods outlined in Federal Specification CCC-T-191b, except as otherwise specified herein.

3. Primers to promote sound adhesion of the wallcovering to the wall substrate and help promote a strippable wall condition, prime wall substrate with a primer recommended by the wallcovering manufacturer.
4. Adhesives -for the purpose of removing wallcovering in the future, use a *Strippable Adhesive* per the recommendation of the wallcovering manufacturer.

2.3 MATERIAL - SCHEDULE

- A. **Vinyl Wall Covering** shall have the following Physical and Performance Requirements and be provided as listed or specified from the following:

1. Product(s): Refer to Interior Finish Legend on drawings
2. Type: Vinyl Wallcovering
3. Content: 100% Vinyl (without Phthalates)
4. Backing: Cellulose, Non-Woven, Polyester
5. Cleaning: Water Based Solvent (WS)
6. Weight: 21 ounces/linear yard
7. Width: 54 inches
8. Repeat: V 18 inches x H 26 inches
9. Hanging Method: Reverse Hang, Random Match
10. Flammability: ASTM E 84 Adhered, Class A
11. Lightfastness: 40 hours
12. Wallcovering Classification: Type II
13. Standards & Certifications: SCS Indoor Advantage Gold
14. Optimized Chemistry: No Phthalates
15. Sustainability: Rapidly Renewable Materials, Ships Carbon Neutral
16. Origin: United States

- B. Trim and Accessories

1. Reveal Trim
2. Edge Trim

2.4 OTHER MATERIALS

- A. Provide adhesive recommended by the wall covering manufacturer for use over intended substrate.
- B. Provide wall primer sealer as recommended by wall covering manufacturer for type of installation required.

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

A. Refer to Division 1 for project coordination requirements.

- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

B. Take all necessary measurements in the field to ensure proper dimensions.

C. Coordinate work under this Section with other trades whose work adjoins, combines, or aligns with same.

D. Examine surfaces scheduled to receive Wall Coverings for conditions that will adversely affect execution, permanence and quality of work. Ascertain that substrates are:

1. Clean, smooth, dry, free of irregularities.
2. Surfaces shall be sound, straight and true within tolerances with joints, dents and nail or screw heads finished flush with the surface, free of defects that would show through the Wall Coverings.

E. Do not apply Wall Coverings until conditions are satisfactory.

F. Maintain areas to receive Wall Coverings at a constant temperature as required by the manufacturer.

1. Maintain temperature for 72 hours before, and during the 48 hours after the application.

G. Remove Wall Covering from its packaging and allow to acclimatize to the area of installation 24 hours before application.

3.4 INSTALLATION (GENERAL)

A. Wallcovering shall be installed by experienced contractors and workers only.

B. Examine each pattern and color before installation to determine they are correct.

- C. Install specified materials in strict accordance with the manufacturer's installation instructions. Wallcovering installers shall read the manufacturer's installation instructions before installing the textile wallcovering.
- D. Install each roll in sequential numeric order. Install each strip in the same order it is cut from the roll.
- E. Wrap all outside and inside corners a minimum of six (6) inches unless a change of pattern or color exists at the corner.
- F. Remove all excessive adhesive from the surface of the wallcovering.

3.5 INSTALLATION OF WALL COVERING

- A. Wallcovering
 - 1. Refer to finish schedules for location, color, type.
 - 2. Refer to construction documents for additional information pertaining to locations.
 - 3. Installation Contractor's Qualifications: All work shall be performed by qualified installers regularly engaged in the installation of wallcoverings of the types specified herein and acceptable to the Architect.
- B. Installation sequence:
 - 1. Place panels consecutively in exact order they are cut from the roll including filling all spaces above or below windows, doors or similar penetrations.
 - 2. Hang Wall Coverings in accord with manufacturer's recommendations.
- C. Trim additional salvage where required to achieve a color and pattern match at seams.
- D. Follow the manufacturer's instructions for mixing adhesive.
- E. When overlapping the edges and double cutting through both thicknesses, exercise care to prevent cutting the substrate.
- F. Wrap a minimum of 6 inches beyond inside and outside corners; no cutting at corners permitted except when color of textile selected is different on adjacent walls. No horizontal seams permitted.
- G. Place textile Wall Coverings before the installation of plumbing fixtures, casings, bases, and cabinets.
- H. Use stiff bristled brush or roller to eliminate air pockets and to secure Wall Coverings to substrate. With a damp sponge, remove excess adhesive from each seam as it is made and wipe clean and dry with a cloth towel.
- I. The installed Wall Coverings shall be secure, smooth, and clean, without wrinkles, gaps or overlaps.

3.6 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator

1. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.
 2. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.7 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
- G. Leave entire area in a neat, clean, acceptable condition.
- H. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- I. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- J. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 09 72 16

SECTION 09 90 00 – PAINTING AND COATINGS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, Division 0, and Division 1 requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable extents of work at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other Sections of Work.
 - 2. Painting in any room in which finishing work is performed, including painting new surfaces as specified and repainting all existing painted surfaces one coat same as last coat specified for similar new work.
 - 3. Painting of all exposed and semi-exposed surfaces.
 - 4. Painting of all surfaces indicated in Drawings, and as herein specified.
 - 5. Painting the primer for wall finish (in addition to and) after Drywall primer/sealer is installed per Section 09 29 00.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society for Testing and Materials:
 - 1. ASTM D523 Standard Test Method for Specular Gloss
- E. Gypsum Association (GA)
 - 1. GA-232 Painting New Gypsum Board
- F. National Fire Protection Agency (NFPA), www.nfpa.org

1. NFPA 703 - Standard for Fire-Retardant Treated Wood and Fire-Retardant Coatings for Building Materials

G. The Society for Protective Coatings (SSPC), www.sspc.org

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Job site inspections shall be done as herein specified and as listed in drawings.

B. Standards:

D. Standards			
Item	Name of Test	Performance	Testing Std.
Interior Applied Paints	V.O.C.	Comply with California Criteria and as herein required when more restrictive.	California Air Resources Board (CARB) or local AHJ whichever is more stringent
			South Coast Air Quality Management District Rule 1113
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

1.4 SUBMITTALS AND MOCKUPS

A. Refer to Division 1 for substitution, deviation and/or submittal procedures.

B. Refer to Division 1 for sustainability requirements

C. Submittals:

1. Product & Technical Data
2. MSDS Sheets
3. Manufacturer Installation Instructions

D. Samples:

1. Brush Outs:
 - a. On 8 x 12 inch heavy cardstock paper, provide four (4) samples of each color, paint type and sheen.

- b. Samples shall be labeled with paint designation number as indicated in drawings and paint type as herein indicated.
 - c. Resubmit each sample as requested until acceptable sheen and color is achieved.
- E. Mock-Ups:
 - 1. Erect at location approved by **Architect**.
 - a. Size:
 - 1) Exposed Steel: 4'-0" long section
 - 2) Gypsum Board: 4'-0" square
 - b. Mock-up shall not be part of final construction once approved by **Architect**.
 - c. Mock-up shall comprise of all components and finishes as specified and indicated in Drawings.
- F. O&M Manuals
 - 1. As part of O&M (Operation and Maintenance) manual submittals per Division 1 requirements, provide the following:
 - a. Two (2) copies of coating maintenance manual, equivalent to Sherwin Williams' "CUSTODIAN"; maintenance manual shall include the following:
 - 1) Location of manufacturer's paint store closest to the project site
 - 2) Area summary with finish schedule
 - 3) Area detail designating where each product, color and finish was used
 - 4) Product Data Sheets and MSDS sheets for each product used
 - 5) Color formulations for each color used
 - 6) Cleaning instructions
 - 7) Touch up procedures
 - 8) Color samples of each color and finish used

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer shall have been in business for **five (5)** years providing/installing/finishing similar size projects and complexity.
- C. Manufacturer shall have been in business for **ten (10)** years providing similar size projects and complexity.
- D. Material with lead times in question or confirmed to be in conflict with meeting the schedule and sequence of construction must be documented at time of bid.
- E. Stipulations:

1. Steel preparation shall comply with SSPC (Steel Structures Painting Council) guidelines and as herein required when more stringent.
 2. Provide finish coats which are compatible with prime paints used.
 - a. Review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates.
 3. Number of coats specified herein are minimum; uniform coverage, free from defects or blemishes is required.
- F. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. **General Contractor** shall request meeting **5 days** in advance of construction. Agenda for meeting shall include, but not be limited to;
1. Substrate preparation
 2. Colors
- G. Manufacturer's Representative: Make arrangements necessary to have a trained employee of the manufacturer on-site periodically during installation work to review installation procedures.
1. Manufacturer's representative shall review and certify in writing all phases of construction to verify the complete work meets specification requirements.
 2. Written certification of all phases of construction shall be sent to the **Architect** by the manufacturer's representative.
- H. Miscellaneous criteria:
1. Upon request from other subcontractors, furnish information on characteristics of finish materials proposed for use, to ensure that compatible prime coats are used.
 - a. Provide barrier coats over incompatible primers or remove and re-prime as required.
 - b. Notify **Architect** in writing of any anticipated problems using coating systems as specified with substrates primed by others.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Deliver all materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information, including but not limited to:
 1. Product Information:
 - a. Paint type
 - b. Manufacturer's name, stock number and date of manufacture
 - c. Contents by volume, for major pigment and vehicle constituents (VOC)
 - d. Thinning instructions
 - e. Application instructions

- f. Manufacturer's color name and number
- 2. Designation Information:
 - a. Project paint designation, ie: "P1", "P2", "P3", etc.
 - b. Sheen type

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, substrates, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
- B. Apply water-based paints only when temperature of surfaces to be painted and surrounding air temperatures are between 55°F and 90°F unless otherwise permitted by paint manufacturer's printed instructions.
- C. Apply VOC compliant solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45°F and 95°F, unless otherwise permitted by paint manufacturer's printed instructions.
- D. Do not apply primers, paint and/or stain in rain, fog, and/or mist, when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.
- E. Painting may be continued during inclement weather only if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional **five (5)** year warranty agreeing to repair and/or replace paint which has failed as a result of defects in materials or workmanship including fading, chipping, rust bleed thru, cracking and chalking.
 - 1. Upon notification of Owner within the warranty period, such defects shall be repaired and replaced at no cost to the Owner.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Wall substrates
 - 2. Floor substrates
 - 3. Component substrates
 - 4. Metal substrates
 - 5. Railings and Assemblies
 - 6. Coordinate with surfaces which might be finished by and/or shop painted, including but not limited to:
 - a. Texturing of gypsum board
 - b. Interior and/or Exterior Flashing
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 03 30 00 – Cast in Place Concrete
 - 3. Section 05 50 00 – Metal Fabrications
 - 4. Section 06 10 00 – Rough Carpentry
 - 5. Section 07 62 00 – Sheet Metal Flashing and Trim
 - 6. Section 09 24 00 – Portland Cement Plaster Assembly
 - 7. Section 09 29 00 – Gypsum Board & Sheathing Substrates

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required cleaning of substrates prior to the installation of materials, components, etc.

1.13 EXTRA MATERIAL

- A. Submit as part of project closeout:
 - 1. Provide Three (3) 1-gallon containers of extra material in each finish paint type, color, sheet, etc. and in same lot as installed product.

- a. Provide in factory packaged and labeled containers; identify containers with project name, manufacturer's paint system, color name and number, and paint sheen as indicated in documents and in accordance with specifications.
- b. Do not supply anything less than the full containers.
- c. For paint that is available only in 5-gallon containers provide one (1) 5-gallon container.
- d. Deliver materials to project premises just prior to substantial completion, and store at location directed by the **Owner**.

1.14 PAINTING EXCLUSIONS AND CLARIFICATIONS

- A. Following categories of work are not included as part of field-applied finish work, or are included in other Sections of these Specifications:
 1. Shop priming: Unless otherwise specified, initial shop priming of metal items is included under various Sections for structural steel, miscellaneous metal items, hollow metal work, and similar items, and for such fabricated components, wood casework, and shop-fabricated or factory-built mechanical and electrical equipment or accessories.
 - a. This shop priming shall not replace the final priming required as herein specified.
 - b. Shop priming shall be compatible with priming and painting as herein specified.
 - c. Steel which will be welded in the field shall be primed and painted after erection and shop priming material shall be compatible with painting products as herein specified.
 2. Pre-finished items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) toilet partitions, finish hardware, plastic laminate casework, exterior insulation system, carpeting, ceramic tile, louver blinds, knock-down steel or aluminum drywall frames, finished electrical equipment including light fixtures, and finished mechanical equipment.
 3. Concealed surfaces: Unless otherwise indicated, painting is not required on wall or ceiling surfaces in concealed areas and generally inaccessible areas, such as foundation spaces, furred areas, pipe spaces and duct shafts.
 - a. Mechanical and Electrical rooms are to be painted.
 - b. Back side of all casework shall be painted.
 4. Finished metal surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.
 5. Operating parts and labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, motor and fan shafts will not require finish painting unless otherwise indicated.
 - a. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

- B. "Paint" as used herein means all coating systems materials, which includes primers, emulsions, enamels, stain, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- C. Paint all exposed surfaces whether or not colors are designated in any "schedule", except where natural finish of material is specifically noted as surface not to be painted.
 - 1. Where items or surfaces are not specifically mentioned, use paint systems of adjacent similar materials in color/finish selected by **Architect**.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each paint type.
- B. Acceptable manufacturers shall be one of the following, as herein listed and in Drawings:
 - 1. General Paint:
 - a. Sherwin Williams, www.sherwinwilliams.com
 - b. Dunn Edwards, www.dunnedwards.com
 - 2. Specialty Touch-up paint for galvanized framing
 - a. ZRC Worldwide, www.zrcworldwide.com
 - 3. Elastomeric Paint:
 - a. Sherwin Williams, www.sherwinwilliams.com
 - 4. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.

2.2 PRODUCT SCHEDULE - EXTERIOR SURFACES

- A. **General:**
 - 1. Application: Typical for specified type/substrate unless otherwise noted.
- B. **Exterior Concrete / Cementitious Substrates (Elastomeric Paint)**
 - 1. Substrates:

- a. Tilt-Up Concrete Construction
 - b. Pre-Cast Concrete
 - c. Cast-in-Place Concrete
 - d. Cement Plaster (scratch, brown, & finish coat)
2. Application: Typical, u.o.n.
- a. Do not use @ cast-in-place concrete exposed foundation walls and curbs @ b.o. exterior walls unless noted on the drawings
3. Product Schedule:

	Application				Manufacturer's Product		
	Product Type	Sheen	Dry Film Thickness (mils)	VOC Limit (g/L)	Sherwin Williams	Alternate: Dunn Edwards	Alternate: Benjamin Moore
1st Coat	Primer	-	8.0 wet 3.2 dry	<50	Loxon Concrete & Masonry Primer LX02 Series	EFF-STOP Select ESSL00	Ultra Spec High Build Masonry Primer #609
2nd Coat	Finish	Flat	13.0 – 16.0 wet 6.0 - 7.5 dry	<50	ConFlex XL Elastomeric High Build Coating CF11 Series	ENDURA-LASTIC 5 EDVL 10	Ultra Spec Elastomeric Waterproof Coating #359
3rd Coat (smooth)	Finish	Flat	13.0 – 16.0 wet 6.0 - 7.5 dry	<50	ConFlex XL Elastomeric High Build Coating CF11 Series	ENDURA-LASTIC 5 EDVL 10	Ultra Spec Elastomeric Waterproof Coating #359
3rd Coat (textured)	Finish (Medium)	Flat	13.0 – 16.0 wet 6.0 - 7.5 dry	<50	ConFlex XL Elastomeric High Build Coating CF12 Series	ENDURA-LASTIC 5 EDVL 10	Coronado Texcrete #3194 (Smooth Texture) #3192 (Sand Texture) #3196 (Medium Texture)

C. Exterior Ferrous Metal (Non-Exposed Steel)

1. Substrates: Exterior ferrous and non-galvanized metals, typical u.o.n.

2. Application: Non-exposed conditions, typical u.o.n.
3. Product Schedule:

	Application				Manufacturer's Product		
	Product Type	Sheen	Dry Film Thickness (mil)	VOC Limit (g/L)	Sherwin Williams	Alternate: Dunn Edwards	Alternate: Benjamin Moore
1st Coat	Primer	-	5.0-10.0 wet 1.9-3.8 dry	<50	Pro-Industrial Pro-Cryl Universal Acrylic Primer B66 Series	ENDURA-PRIME ENPR00	Ultra Spec HP Acrylic Metal Primer #HP04
2nd & 3rd Coats	Finish	Semi-Gloss	6.0-12.0 wet 2.2-4.2 dry	<50	Pro-Industrial Acrylic B66 Series	ENDURA-PRIME ENPR00	Ultra Spec HP Acrylic DTM #HP29

D. Exterior Ferrous Metal (Architectural Features / Exposed Steel)

1. Substrates: Exterior Architecturally Exposed Structural Steel (AESS) and other exposed exterior ferrous metals.
2. Application: Exposed conditions, typical, u.o.n.
3. Exceptions:
 - a. Flashing:
 - 1) Associated with storefront, curtain wall and/or window wall, Section 08 41 00 shall be provided by storefront / curtain wall manufacturer and have same finish as storefront / curtain wall, U.N.O.
 - b. Reveals, expansion joints, etc.
 - 1) Finish:
 - a) Manufacturer finish per Section 09 24 00 – Portland Cement Plaster Assembly
 - b) Painted per Section 09 90 00 – Painting and Coatings

4. Product Schedule:

	Application				Manufacturer's Product		
	Product Type	Sheen	Dry Film Thickness (mil)	VOC Limit (g/L)	Sherwin Williams	Alternate: Dunn Edwards	Alternate: Benjamin Moore
1st Coat	Primer	Low Sheen	5.0-10.0 wet 1.8-3.6 dry	<100	ProIndustrial ProCryl Universal Acrylic Primer B66-310	US Coatings EpoxyGrip 2300	Acrylic Metal Primer #HP04

2nd & 3rd Coats	Finish	Semi-Gloss	4.0-5.0 wet 1.4-1.7 dry	<50	ProIndustrial Waterbased Alkyd Urethane B53-1150 Series (Semi- Gloss)	US Coatings UreGrip 3000 HS VOC	Ultra Spec HP D.T.M. system: Semi- Gloss #HP29
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E. Exterior Galvanized Metal & Aluminum, typical u.o.n.

1. Substrates:

- a. Exterior Galvanized Metals, typical u.o.n. (includes reveals and expansion joints unless specifically noted not to be painted)
- b. Aluminum

2. Application: Typical u.o.n., excluding galvanized handrail and guardrail assemblies

3. Exceptions:

a. Flashing:

- 1) Associated with storefront, curtain wall and/or window wall, Section 08 41 00 shall be provided by storefront / curtain wall manufacturer and have same finish as storefront / curtain wall, U.N.O.

b. Reveals, expansion joints, etc.

1) Finish:

- a) Manufacturer finish per Section 09 24 00 – Portland Cement Plaster Assembly
- b) Painted per Section 09 90 00 – Painting and Coatings

4. Product Schedule:

	Application				Manufacturer's Product		
	Product Type	Sheen	Dry Film Thickness (mil)	VOC Limit (g/L)	Sherwin Williams	Alternate: Dunn Edwards	Alternate: Benjamin Moore
1st Coat	Primer	-	5.0-10.0 wet 1.9-3.8 dry	<50	Pro-Industrial Pro-Cryl Universal Acrylic Primer B66 Series	ULTRA-SHIELD Galvanized Metal Primer ULGM00	Ultra Spec HP Acrylic Metal Primer #HP04
2nd & 3rd Coats	Finish	Semi-Gloss	6.0-12.0 wet 2.2-4.2 dry	<50	Pro-Industrial Acrylic B66 Series	ENDURA-COAT ENCT50	Ultra Spec HP Acrylic D.T.M. #HP29

5. Preparation:

- a. Clean with Manufacturer's product for substrate condition

- b. When mildew is present the wood to receive Oil Based Finish:
 - 1) Clean with a solution of:
 - a) 4 ounces of non-ammoniated detergent (TSP) +
 - b) 1 quart of outdoor bleach +
 - c) 3 quarts of fresh potable water
 - 2) Let solution set on surface for 10-15 minutes then rinse thoroughly with potable water.
 - 3) Refer to mfg'r's instructions for additional information.
 - 4) Lightly sand any area where the grain has been raised with a maximum of 80 grit paper.
- 6. Installation:
 - a. Typical
 - 1) Apply two coats of Flood's finish with sprayer
 - a) Air-less sprayer .011 - .015 fluid tip / 700 - 800 psi or less
 - i. Refer to mfg'r's instructions for additional information.
 - b) Touch-up with high quality synthetic stain brush.
 - c) Back roll to insure penetration.
 - 2) Where the finish is not absorbed, wipe excess with a clean cloth.
 - a) Cloth type shall be woven material that will not leave material residue on the beams.

2.3 PRODUCT SCHEDULE - INTERIOR SURFACES

A. **Interior Aluminum, Ferrous Metal (Non-exposed), and Galvanized Metal**

- 1. Substrates:
 - a. Aluminum
 - b. Interior ferrous metals, typical u.o.n.
 - c. Galvanized metals, typical u.o.n. (excluding handrail and guardrails)
- 2. Application: Non-exposed conditions, typical u.o.n.
- 3. Exceptions:
 - a. Flashing:
 - 1) Associated with storefront, curtain wall and/or window wall, Section 08 41 00 shall be provided by storefront / curtain wall manufacturer and have same finish as storefront / curtain wall, U.N.O.
 - b. Reveals, expansion joints, etc.
 - 1) Finish:

- a) Manufacturer finish per Section 09 29 00 – Gypsum Board & Sheathing Substrates
- b) Painted per Section 09 90 00 – Painting and Coatings

4. Product Schedule:

	Application				Manufacturer's Product		
	Product Type	Sheen	Dry Film Thickness (mil)	VOC Limit (g/L)	Sherwin Williams	Alternate: Dunn Edwards	Alternate: Benjamin Moore
1st Coat	Primer	-	5.0-10.0 wet 1.9-3.8 dry	<50	Pro-Industrial Pro-Cryl Universal Acrylic Primer B66 Series	ENDURA-PRIME Metal Primer ENPR00	Ultra Spec HP Acrylic Metal Primer #HP04
2nd & 3rd Coats	Finish	Satin	4.0 wet 1.7 dry	<50	Solo A75 (Satin)	SWLL40 (Low Sheen)	Ultra Spec 500 Zero VOC Interior Latex #537 (Low Sheen)

B. **Gypsum Board Walls and Ceilings**

- 1. Substrates: Gypsum Board substrates per Section 09 29 00 – Gypsum Board & Sheathing Substrates.
- 2. Application: Typical, u.o.n.
- 3. Product Schedule:

	Application				Manufacturer's Product		
	Product Type	Sheen	Dry Film Thickness (mil)	VOC Limit (g/L)	Sherwin Williams	Alternate: Dunn Edwards	Alternate: Benjamin Moore
1st Coat	Primer	-	4.0 wet 1.0 dry	<50	ProMar 200 Zero VOC Latex Primer B28 Series	VINYLASTI C Select VNSL00	Ultra Spec 500 Latex Primer #534
2nd & 3rd Coats	Finish	Eg-Shel	4.0 wet 1.4-1.7 dry (depending on sheen)	<50	ProMar 200 Zero VOC Interior Latex B20 Series (Eg-Shel)	SPARTA Series SSLL30 (Egg Shell)	Ultra Spec 500 Zero VOC Interior Latex #538 (Eggshell)

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C. Interior Wood (Painted)

1. Substrates: Interior wood including, but not limited to Glu-Lam and Sawn Timber beams, columns, and diagonal members, wood decking and sheathing, trim, and back of casework.
2. Application: Typical, u.o.n.
3. Product Schedule:

	Application				Manufacturer's Product		
	Product Type	Sheen	Dry Film Thickness (mil)	VOC Limit (g/L)	Sherwin Williams	Alternate: Dunn Edwards	Alternate: Benjamin Moore
1st Coat	Primer	-	4.0 wet 1.4 dry	<50	Premium Wall & Wood Latex Primer B28 Series	Interkote IKPR00	Fresh Start All Purpose Primer #046
2nd & 3rd Coats	Finish	Egg-Shell	4.0 wet 1.4-1.7 dry (depending on sheen)	<50	ProMar 200 Zero VOC Interior Latex B20 Series (Eg-Shel)	SPARTA Series SSLL30 (Egg Shell)	Ultra Spec 500 Zero VOC Interior Latex #538 (Eggshell)

D. Interior Pipe Identification

1. Substrates: Metal Piping
2. Application: Typical where pipes are not specified to receive insulated pipe wraps, u.o.n.; coordinate with Mechanical drawings and specifications.
3. Product Schedule:

	Application				Manufacturer's Product		
	Product Type	Sheen	Dry Film Thickness (mil)	VOC Limit (g/L)	Sherwin Williams	Alternate: Dunn Edwards	Alternate: Benjamin Moore
1st Coat	Primer	-	4.0 wet 1.0 dry	<50	Pro-Industrial Pro-Cryl Universal Acrylic Primer B66 Series	ENDURA-PRIME Metal Primer ENPR00	Ultra Spec HP Acrylic Metal Primer #HP04
2nd & 3rd Coats	Finish	Gloss	4.0-5.0 wet 1.4-1.7 dry	<50	Pro-Industrial Waterbased Alkyd Urethane B53 Series	ENDURA-COAT ENCT60	Ultra Spec HP D.T.M. Gloss HP28

2.4 SPECIALTY PAINTS AND COATINGS

- A. Anti-Slip Paint / Coating:
 - 1. Schedule: Interior
 - a. As indicated in drawings
 - 2. Schedule: Exterior
 - a. As indicated in drawings

2.5 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** and subject to the approval of the **Architect**.

PART 3 - EXECUTION

3.1 INSPECTION/EXAMINATION

- A. Applicator must examine areas and conditions under which painting work is to be performed and notify **General Contractor** in writing of conditions detrimental to proper and timely completion of work.
 - 1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.
 - 2. Confirm water vapor emission of concrete surfaces to be painted do not exceed manufacturer's recommendations.
 - 3. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of durable paint film
 - 4. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to applicator.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.
 - 1. General:
 - a. Perform all preparation and cleaning procedures in strict accordance with paint/stain manufacturer's instructions and as herein specified, for each particular substrate condition.
 - b. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish painted, or provide surface-applied

protection prior to surface preparation and painting operations. Remove if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items by workmen skilled in trades involved.

c. Clean surfaces to be painted before applying material.

- 1) Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program cleaning and painting so that dust and other contaminants from cleaning process will not fall in wet, newly painted surfaces.
- 2) Shot blast all area's to remove rust and other contaminants in accordance with SSPC guidelines.

2. Wood:

- a. Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off.
- b. Prime, stain, or seal wood required to be job painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, etc; interior and exterior trim, fascia, wood doors and plywood.
- c. When transparent finish is required, use spar varnish for backpriming.
- d. Seal tops, bottoms and cut-outs and all edges not covered with veneer of wood doors with heavy coat of varnish or equivalent sealer immediately upon delivery to job.
- e. Scrape and clean small, dry, seasoned knots and apply thin coat of white shellac or other recommended knot sealer, before application of priming coat.
- f. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

3. Metal / Steel:

a. Ferrous metals:

- 1) Clean non-galvanized, ferrous surfaces that have not been shop-coated of all oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning, complying with Steel Structures Painting Council (SSPC)-SP3.
- 2) Sand blast all non-galvanized, ferrous surfaces that have not been shop-coated of all rust and other foreign substances by mechanical blast cleaning, complying with Steel Structures Painting Council (SSPC)-SP6.
- 3) Comply with SSPC guidelines in addition to these instructions.

b. Galvanized surfaces

- 1) Clean free of oil and surface contaminates with acceptable non-petroleum based solvent.
- 2) Comply with SSPC guidelines in addition to these instructions.

c. Metal Decking

- 1) Factory Primed:
 - a) Field fog finish painted for acoustical deck locations, coordinate with metal deck manufacturer.
- 2) Factory Finish Painted:
 - a) Field tough up in accordance with this specification and paint in accordance with metal decking Section.
4. Exposed Architectural Steel: (Structural and non-structural components included)
 - a. All steel that is exposed to view at interior & exterior shall be cleaned, prepared and primed for an Architectural painted finish.
 - 1) Ferrous metals:
 - a) Clean non-galvanized, ferrous surfaces that have not been shop-coated of all oil, grease, dirt, loose mill scale and other foreign substances by solvent and mechanical cleaning, complying with Steel Structures Painting Council (SSPC)-SP3.
 - b) Sandblast all non-galvanized, ferrous surfaces that have been shop-coated of all rust and other foreign substances by mechanical blast cleaning, complying with Steel Structures Painting Council (SSPC)-SP6.
 - c) Clean all non-galvanized, ferrous surfaces that have been shop-coated of all foreign substances by chemical cleaning, complying with Steel Structures Painting Council (SSPC)
 - d) Comply with SSPC guidelines in addition to these instructions.
 - e) Remove all burrs / scratches, etc.
 - f) Prepare all surfaces to be smooth – fill voids & imperfections to achieve smooth surfaces.
 - b. Galvanized surfaces
 - 1) Clean free of oil and surface contaminates with acceptable non-petroleum based solvent.
 - 2) Prepare all surfaces to be smooth – fill voids & imperfections to achieve smooth surfaces.
 - 3) Remove all burrs / scratches, etc.
 - 4) Fill all gaps left where welding occurs between two items to achieve a continuous & even joint.
 - 5) Comply with SSPC guidelines in addition to these instructions.
5. Concrete:
 - a. Clean concrete surfaces to be painted of dirt, oil, or other foreign substances with scrapers, VOC compliant cleaners, and sandpaper, as required.
 - b. Prime concrete as required by paint manufacturer.

- c. Tape the locations for stair tread stripes to install true and straight edges of contrasting stripes.

3.4 INSTALLATION

A. General:

1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
2. Apply paint by brush, roller, spray, or other acceptable practice in accordance with manufacturer's directions.
 - a. Use brushes best suited for type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by paint manufacturer for material and texture required.
 - 1) Roll apply 1st coat of paint typical at all wall and ceiling applications.
 - 2) Install finish coats with sprayer at all interior and exterior exposed Architectural/structural steel locations.
3. Number of coats and paint film thickness required is same regardless of application method. Do not apply succeeding coats until previous coat has completely dried and inspected. Sand between each enamel or varnish coat application with fine sandpaper or rub surfaces with pumice stone where required to produce even, smooth surface in accordance with manufacturer's directions.
4. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive film thickness equivalent to that of flat surfaces.
5. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts, where visible through registers or grilles, and other surfaces indicated on Drawings with flat non-specular black paint, before final installation of equipment.
7. Paint back sides of access panels, removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges same as exterior faces, unless otherwise indicated.
9. Painting of mechanical and electrical work is limited to those items exposed in Mechanical Equipment Rooms and in occupied spaces.
10. Doors: Finish tops, bottoms and edges of doors to provide same appearance as balance of door; re-seal all trimmed edges and mortising on factory sealed doors immediately after fitting by the finish carpenter.
11. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

- B. Mechanical items to be painted include, but are not limited to, following:
 - 1. Piping, pipe hangers, and supports, when exposed in finished spaces.
 - 2. Motors, mechanical equipment, and supports.
 - 3. Accessory items.
- C. Electrical items to be painted include, but are not limited to, following:
 - 1. Conduit and fittings.
 - 2. Switchgear.
- D. Minimum coating thickness: Apply each material at not less than manufacturer's recommended spreading rate, to provide total dry film thickness as indicated.
- E. Prime coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure finish coat with no burn-through or other defects due to insufficient sealing.
- F. Scheduling painting: Apply first-coat material to surfaces that have been cleaned, pre-treated, primed and/or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. All materials shall be applied and cut in neatly to ensure uniform drying to the color and sheen specified, free from runs, sags, wrinkles, shiners, streaks and brush marks.
 - 2. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of under coat.
 - 3. Each coat of paint or finish must be inspected and approved before application of the succeeding specified coat, failure to comply with the inspection and approval requirements for successive coats will necessitate recoating at the painting contractor's expense wherever work is not properly credited. The painting contractor must furnish a report of each coat applied when completed for inspection and approval to comply with the above. Notify the **Architect** in advance of completed coats to be inspected.
- G. Pigmented (opaque) finishes: Completely cover to provide opaque, smooth surface of uniform finish, color, appearance, and coverage.
 - 1. Vary each coat of paint in shade from the preceding coat in a manner which renders each coat readily distinguishable without affecting finish color. Touch up all blemishes.
- H. Transparent (clear) finishes: On exposed portions, use multiple coats to produce glass-smooth surface film continuity of even luster. Provide finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
- I. Brush application: Brush-out and work all brush coats onto surfaces in even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable. Neatly draw all glass and color break lines.

- J. Mechanical applicators: Use mechanical methods for paint application when permitted by governing ordinances and trade union regulations. If permitted, limit to only those surfaces impracticable for brush applications.
1. Limit roller application (generally) to interior wall and ceiling finishes for second and third coats. Apply each roller coat to provide equivalent hiding as brush-applied coats.
 2. Where spray application is used, apply each coat to provide equivalent hiding of brush-applied primer. Do not double back with spray equipment for purpose of building up film thickness of two coats in one pass.

3.5 FIELD QUALITY CONTROL

- A. Product Manufacturer shall provide field service support as requested by the Installer/Applicator
- B. **General Contractor** and the Product Manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications. The Applicator shall be responsible for the proper application of the materials.
- C. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.6 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 09 90 00

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, Division 0 and Division 1 requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work required by project conditions, including, but not limited to:
 - 1. Code and ADA required signage:
 - a. All signage shall meet with standards and codes as herein listed, whether listed or not, and comply with the most restrictive requirements.
 - 2. Accessories:
 - a. Adhesives, fasteners and accessories, as required for complete installed assembly, specified or not.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. Leadership in Energy and Environmental Design (LEED), www.usgbc.org/LEED (United States Green Building Council (USGBC))
 - 1. Refer to Division 1 for version of LEED Rating System and Reference Guide applicable to project.
- E. Collaborative for High Performance Schools (CHPS), www.chps.net
- F. International Code Council (ICC), www.iccsafe.org
- G. Refer to standards herein listed with specific products/materials.

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. **General:**
 - 1. Comply with manufacturer's standards.

2. Comply with Building Code.
3. Refer to Division 1 for additional requirements for DSA projects
4. Comply with Building Code, ADA, and CBC Title 24 most restrictive requirements and in accordance with DSA interpretations.

B. Standards:

Item	Name of Test	Performance	Testing Standard
Signage and Identification	General	Comply	California Building Code including, but not limited to CBC 11-B Division 7, and CBC Chapter 10 & ATBCB ADAAG.
Raised Characters	Depth	Comply	CBC 11B-703.2.1
	Case	Comply	CBC 11B-703.2.2
	Style	Comply	CBC 11B-703.2.3
	Proportions	Comply	CBC 11B-703.2.4
	Character height	Comply	CBC 11B-703.2.5
	Stroke thickness	Comply	CBC 11B-703.2.6
	Character spacing	Comply	CBC 11B-703.2.7
	Line spacing	Comply	CBC 11B-703.2.8
Braille	Format	Comply	CBC 11B-703.2.9
	Type	Comply	CBC 11B-703.3
	Dimensions & capitalization	Comply	CBC 11B-703.3.1 Table 11B-703.3.1
Installation height and placement	Position	Comply	CBC 11B-703.3.2
	Tactile signs (except for tactile characters at elevator car controls)	Comply	CBC 11B-703.4.1
Visual Characters (non-Tactile signs)	Location	Comply	CBC 11B-703.4.2
	Finish and Contrast	Comply	CBC 11B-703.5.1
	Case	Comply	CBC 11B-703.5.2
	Style	Comply	CBC 11B-703.5.3
	Character Proportions	Comply	CBC 11B-703.5.4
	Character Height	Comply	CBC 11B-703.5.5
	Height from finish floor or ground	Comply	CBC 11B-703.5.6
	Stroke thickness	Comply	CBC 11B-703.5.7
	Character spacing	Comply	CBC 11B-703.5.8
	Line spacing	Comply	CBC 11B-703.5.9
Pictograms	Pictogram field	Comply	CBC 11B-703.6.1
	Finish and contrast	Comply	CBC 11B-703.6.2
	Text descriptors	Comply	CBC 11B-703.6.3
	Finish and Contrast	Comply	CBC 11B-703.7.1

Symbols of Accessibility	Symbols	International Symbol of Accessibility	CBC 11B-703.7.2.1
		International Symbol of TTY	CBC 11B-703.7.2.2
		Volume Control Telephones	CBC 11B-703.7.2.3
		Assistive Listening Systems	CBC 11B-703.7.2.4
		Cleaner Air Symbol	CBC 11B-703.7.2.5
		Toilet & Bathing Facility geometric symbols	CBC 11B-703.7.2.6
Sign Body	Thickness	1/4", u.n.o.	
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
 - a. Refer to product criteria identified herein.

1.4 SUBMITTALS AND MOCK-UPS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit the following for **Architect's** review:
 1. Manufacturer product data and technical data sheets
 2. Product MSDS sheets
 3. Shop drawings
 - a. Floor plan showing each sign location
 - b. Sign Schedule with sign type, room/location, sign message
 - c. Drawings showing each sign configuration, including raised characters, braille and pictograms and colors
 - d. Drawings showing poles/posts and footings (for exterior pole mounted signage)
 4. Samples:
 - a. Samples of each type of cast, cut or engraved signs including, but not limited to, Braille, Pictorial symbols, and raised characters
 - b. 4" x 6" size color samples for selection of signage colors by **Architect**
- E. Mock-up
 1. Provide mockup of exterior and interior signs in each mounting configuration / location, i.e. door mounted, wall mounted, post mounted, adhesively applied, mechanically fastened, etc.
 - a. Erect at location approved by **Architect**.

2. Mock-up shall be part of final construction once approved by **Architect**.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Deliver and store products suitable wrapped or packaged to protect against damage. Do not remove protective coverings until time of installation.
 1. Protect finish and edges in accordance with panel manufacturer's recommendations.
 2. Store material in accordance with panel manufacturer's recommendations.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.
- D. Inspection: Tactile signs shall be field inspected for compliance after installation (11B-703.1.1.2)

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional **Lifetime** warranty agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to the following:
 - 1. Building walls, windows and doors
 - 2. Site parking, flatwork, paving, footings, etc.
- B. Related Sections include, but are not limited to the following:
 - 1. Division 1
 - 2. Section 02 41 13 – Selective Site Demolition and Protection
 - 3. Section 02 41 19 – Selective Building Demolition and Protection
 - 4. Section 03 30 00 – Cast in Place Concrete
 - 5. Section 08 11 13 – Steel Doors and Frames
 - 6. Section 08 14 00 – Wood Doors
 - 7. Section 08 80 00 – Glass and Glazing
 - 8. Section 09 24 00 – Portland Cement Plaster Assembly
 - 9. Section 09 29 00 – Gypsum Board and Sheathing Substrates
 - 10. Section 09 90 00 – Painting and Coating

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 - 2. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 - 1. Signage Manufacturer:
 - a. Advance Corporation, Braille-Tac™ Division, www.advancecorp.com
 - b. Apco www.apcosigns.com
 - c. Gemini Incorporated, www.signletters.com

- d. In-Pro Signscape, www.inprocorp.com
- e. Interface Architectural Signage, Inc., www.interfacedesign.com
- f. Mohawk Sign Systems, www.mohawksign.com
- g. ProAd Signs, www.proadsigns.com
- h. Takeform Architectural Graphics, www.takeform.net
- 2. Fire Extinguisher Signage:
 - a. Seton, www.seton.com
- 3. Plastic Material:
 - a. Rowmark, www.rowmark.com
- 4. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS – SITE VEHICULAR, EXITING AND ACCESSIBILITY SIGNAGE

- A. General:
 - 1. Refer to details for additional information, design criteria and posts and footing requirements.
 - 2. Coordinate with Section 03 30 00 – Cast-in-Place Concrete
 - 3. Coordinate with Section 05 50 00 – Metal Fabrications.
- B. Material:
 - 1. Sign: Stainless steel
 - 2. Text: Powder coated or Silk screen
- C. Post Mounted:
 - 1. Posts:
 - a. Aluminum square tubes
 - b. Galvanized steel pipe
 - 2. Footings: Concrete

3. Fasteners:
 - a. Type: Tamper resistant machine bolt, washer, lock washer & tamper proof nut
 - b. Material: Stainless steel
 - c. Size: 1/4" dia. X length required
- D. Wall Mounted:
 1. Fasteners:
 - a. Masonry walls:
 - 1) Type: Drilled expansion anchor/tamper resistant fastener, washer & lock washer
 - 2) Material: Stainless steel
 - 3) Size: 3/16" dia. X length to penetrate 1-1/2" min.
 - b. Metal and wood stud framing
 - 1) Type: Self tapping with washer and lock washer
 - 2) Material: Stainless steel
 - 3) Size: 1/8" dia. X length to penetrate framing 1" min.
 - E. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**

2.3 MATERIAL – EXTERIOR BUILDING MOUNTED SIGNAGE

- A. General
 1. Refer to documents for additional information and design criteria
 2. Signage Type:
 - a. Partial Inlay, uno.
- B. Material
 1. Acrylic – Face of Sign
 2. Vinyl – Raised Characters, Visual Characters and Pictograms
- C. Raised Characters
 1. Partial inlay
 2. Raised 1/32"
 3. Beveled edges
- D. Visual Characters and Pictograms
 1. Partial inlay
- E. Braille
 1. Partial inlay

- 2. Raised
 - a. Contracted Grade 2 California Braille
- F. Configuration
 - 1. Size: Refer to details
 - 2. Sign Edges: Beveled Straight
- G. Installation:
 - 1. Door mounted signs shall be installed with 1" wide x 62 mil thick 3M VHB 5962 Conformable Tape applied continuously along all four sides of sign and set 1/4" clear of outside edge of sign.
 - 2. Wall mounted signs shall be installed with tamper resistant stainless steel fasteners at all four sides of sign, typical u.o.n.
 - a. Masonry/Stone: Drilled expansion anchors x 1-1/2" embedment
 - b. Metal Studs: Self tapping x 1" embedment
 - c. Wood studs: Self tapping x 1" embedment
 - d. Wall mounted signs shall be installed with 1" wide x 62 mil thick 3M VHB 5962 Conformable Tape applied continuously along all four sides of sign and set 1/4" clear of outside edge of sign.
 - 3. Glass mounted signs shall be installed with 1" wide x 62 mil thick 3M VHB 5962 Conformable Tape applied continuously along all four sides of sign and set 1/4" clear of outside edge of sign.
 - a. Install blank sign on opposite side of glass which matches size & color of informative
- H. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**

2.4 MATERIAL – INTERIOR SIGNAGE

- A. Material:
 - 1. Acrylic – Face of Sign
 - 2. Vinyl – Raised Characters, Visual Characters and Pictograms
- B. Raised Characters
 - 1. Partial inlay
 - 2. Raised 1/32"
 - 3. Beveled edges
- C. Visual Characters and Pictograms
 - 1. Partial inlay
- D. Braille
 - 1. Partial inlay

2. Raised

- a. Contracted Grade 2 California Braille

E. Configuration

1. Size: Refer to details

F. Sign Edges: Beveled Straight

G. Installation:

1. Door mounted signs shall be installed with 1" wide x 62 mil thick 3M VHB 5962 Conformable Tape applied continuously along all four sides of sign and set 1/4" clear of outside edge of sign.
2. Wall mounted signs shall be installed with tamper resistant stainless steel fasteners at all four sides of sign, typical u.o.n.
 - a. Masonry/Stone: Drilled expansion anchors x 1-1/2" embedment
 - b. Metal Studs: Self tapping x 1" embedment
 - c. Wood studs: Self tapping x 1" embedment
 - d. Wall mounted signs shall be installed with 1" wide x 62 mil thick 3M VHB 5962 Conformable Tape applied continuously along all four sides of sign and set 1/4" clear of outside edge of sign.
3. Glass mounted signs shall be installed with 1" wide x 62 mil thick 3M VHB 5962 Conformable Tape applied continuously along all four sides of sign and set 1/4" clear of outside edge of sign.
 - a. Install blank sign on opposite side of glass which matches size & color of informative sign.

H. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**

2.5 SIGN SCHEDULE:

A. General:

1. Refer to drawings for sign schedules, details, and other information, including but not limited to:
 - a. Sign size
 - b. Text size
 - c. Mounting height
2. Final sign colors shall be selected by Architect at time of submittal.

2.6 MATERIAL – FIRE EXTINGUISHER SIGNAGE – Not Used

A. Fire Extinguisher Signage:

1. Mfgr: Seton
2. Model: 39429

3. Type: Luminous
4. Shape: 2-sided with fastening flanges
5. Size: 7.5" wide x 18" tall overall
6. Material: Glow-in-the-dark Contrasting Color with letters and graphics
7. Text: "Fire Extinguisher"
8. Graphics:
 - a. Symbol: Arrow pointing down with text in arrow
 - b. Location: Install centered above fire extinguisher; confirm height with Fire Department
9. Braille: None
10. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**

PART 3 - **EXECUTION**

3.1 INSPECTION / EXAMINATION

- A. Verification of Conditions:
 1. Examine areas and conditions under which work is to be performed.
 2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.
- B. Surface:
 1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.
- C. Backing:
 1. Coordinate that appropriate backing is installed for sign mounting.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.
- B. Take all necessary measurements in the field to ensure proper dimensions.

3.4 FABRICATION

- A. Fabricate signs in compliance with drawings, applicable codes, agencies having jurisdiction and ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines.

3.5 INSTALLATION

A. General:

1. Prior to installation, carefully inspect and verify that the installed work of other trades is complete to the point where this installation may properly commence.
2. Verify that specified items may be installed in accordance with the approved design.
3. All pole mounted sign poles shall be installed in concrete footing and in compliance with plan details.
4. Signage Mounting:
 - a. Locations of all signs must be approved by the **Architect** prior to installation.
 - b. Refer to specific sign type for mounting requirements.
 - c. Coordinate with Drawings

B. Fastening

1. Use fasteners as herein specified.

3.6 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 10 14 00

SECTION 10 28 00 – ACCESSORIES

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions, clearances and heights at the jobsite.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - a. Toilet and/or restroom, janitor room, shower, etc. accessories as indicated on drawings, as herein specified and as needed for a complete installation.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - a. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. American Society For Testing and Materials (ASTM), www.astm.org
- E. Aluminum Association (AA), www.aluminum.org
- F. Energy Star, www.energystar.gov
- G. Green Spec, www.greenspec.com
- H. National Association of Architectural Metal Manufacturer's, (NAAMM) www.naamm.org
 - a. Architectural Metal Products Division
- I. National Fire Protection Agency (NFPA)
 - a. NFPA 101 Life Safety Code
- J. The Association of Electrical and Medical Imaging Equipment Manufacturers (NEMA), www.nema.org
- K. Underwriters Laboratory (UL), www.ul.com
- L. United States Food and Drug Administration (FDA), www.fda.gov
- M. Refer to standards herein listed with specific products/materials.

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

- a. Comply with manufacturers standards
- b. Comply with Building Code.
- c. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Automatic Soap Dispenser	Operation	Flow amount adjusted and sensitivity adjusted	Mfgr
Materials	Type	100% Stainless Steel x 304 or 304L	Mfgr.
	Finish: Accessories	Satin No. 4	
	Finish: Grab Bars	Peened, non-slip	
Mounting Heights and clearances	Accessibility	Comply	CA Title 24 & ADA (most restrictive shall govern) Refer also to drawings
Refer to drawings and as herein specified			

C. Sustainability:

- a. Refer to Division 1 sustainability requirements.
- b. Refer to product criteria identified herein.

D. Construction Testing:

Item	Name of Test	Performance Results	Testing Std.
Accessory Locks	Lock functions with key	Functions / comply	N/A
Soap Dispensers	Soap filled and dispenses fluid correctly	Functions / comply	N/A
Automatic Soap Dispensers	Power source connected/installed and sensitivity and flow amount adjusted	Comply	Mfgr.
Refer to drawings and as herein specified			

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings.

- a. Schedule of all accessories and indicated with designation to match Architectural drawings.
- b. Cut sheets of all accessories
- c. Warranty information
- d. Finish options
- E. Submit samples.
 - a. N/A

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing / installing / finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for **ten (10)** years providing/installing/finishing projects of similar size and complexity.
- D. Stipulations:
 - a. Set toilet tissue dispenser in the proper location as the recessed unit is not dual handed.
 - b. The use of manufacturer's product numbers establishes required minimum standards and does not preclude other manufacturers.
 - a. Other manufacturers shall be assembly criteria and function criteria.
 - b. Refer to SUBMITTALS section/heading
 - c. Paper towel dispensers shall be Universal paper type, non proprietary type.

Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include, but not be limited to;

- c. Layout both laterally and vertically of components at walls
- d. Required recess depths for equipment / accessories
- e. Coordination with plumbing fixture actually sizes which could affect layout and locations of accessories such as, but not limited to; toilet tissue dispensers.
- E. Miscellaneous criteria:
 - a. Mounting heights for all accessories shall be confirmed and coordinated with drawings, building code and ADA.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. provided by others are installed correctly before proceeding with installation of products as herein specified.
- B. Confirm all wall openings are set at proper locations to insure wall recessed accessories will comply with accessible heights and locations.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.
- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish initial **one (1)** year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - a. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.
- C. Furnish manufacturer's additional warranties agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - a. Schedule:
 - a. Mechanical Soap Dispensers: 3 years
 - b. Electric Hand Dryers:
 - 1) 3 years: motor brushes
 - 2) 10 years: all other parts/components
 - c. Automatic Soap Dispensers: Lifetime
 - b. Upon notification of Owner within the warranty period, such defects shall be repaired and replaced at no cost to the Owner.

1.10 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to, the following:
 - a. Wall framing
 - b. Wall substrate and backing
 - c. Wall finish
 - d. Electrical wiring

- e. Plumbing fixture layout and sizes
- B. Related Sections include, but are not limited to, the following:
 - a. Division 1
 - b. Section 07 92 00 – Sealants and Caulking
 - c. Section 09 29 00 – Gypsum Board and Sheathing Substrates (includes tackable wall sheathing and cement backer boards)
 - d. Section 09 90 00 – Painting and Coating

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - a. Complete instructions regarding operation of the equipment.
 - b. Complete instructions regarding maintenance of the equipment, materials, finishes, etc.
 - c. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Schedule required testing, prior to the installation of materials, components, etc.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as listed herein and in Drawings:
 - a. Accessories:
 - a. Bobrick Washroom Equipment, Inc., www.bobrick.com
 - b. Hillyard, www.hillyard.com
 - c. Bradley Washroom Accessories, www.bradleycorp.com
 - b. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.

- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. General:

- a. Refer to Drawings for product type, model, locations & quantities, uno. and/or herein indicated
- b. Manufacturer: As herein specified and/or indicated in drawings
- c. Any substitutions shall be building code and ADA accessible and meet standards and features of listed mfr. & product.

B. **Soap Dispenser:**

- a. Manufacturers: As furnished by the **Owner**
- b. Accessories:
 - 1) Fasteners, and finish hardware shall be 100% stainless steel.

C. **Paper Towel Dispenser:**

- a. Manufacturers: Hillyard
- b. Features:
 - a. Hands-Free, Controlled Roll.

D. **G Grab bars:**

- a. Material: 100% stainless steel construction.
- b. Mfgr: Bobrick or approved equivalent
- c. Size:
 - a. Diameter: 1-1/2 inch outside diameter,
 - b. Gauge: 18 gauge
 - c. Material: Stainless steel
 - d. Mounting: With concealed mounting flange and fastened into backing
- d. Offset: 1-1/2 inch clear offset from wall surface.
- e. Mounting:
 - a. Concealed mounting plate secured with minimum three 1/4 inch diameter stainless steel (teks) self-drilling or machine screws. Note concealed mounting plates shall have snap flange covers.
 - 1) Mounting: Grab bar manufacturer's mounting system and components

2) Flange: 13 gauge

f. Notes:

a. Refer also to drawings for additional information

- E. **Sanitary Napkin** – *Not Used*
- F. **Specialty Hardware** – *Not Used*
- G. **Electric Hand Dryer** – *Not Used*
- H. **Automatic Soap Dispenser** – *Not Used*

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the **General Contractor** subject to the approval of the **Architect**.

PART 3 - EXECUTION

3.1 INSPECTION/EXAMINATION

- A. Verification of Conditions:
 - a. Examine areas and conditions under which work is to be performed.
 - b. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.
 - c. Do not proceed until unsatisfactory conditions are corrected.
- B. Surface:
 - a. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.
 - b. Examine all wall recesses are in proper location and proper depths.

3.2 COORDINATION

- A. Refer to Division 1 for project coordination requirements.
- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. The **General Contractor** shall provide recesses, anchorage and back-up blocking in sizes and in locations as shown on approved Shop Drawings.
 - a. Coordinate with other trades where necessary to make provisions for installation.
- B. Securely anchor all items in place in locations and at mounting heights indicated. Where specified dimensions are not noted, install as directed by **Architect**.

3.4 INSTALLATION

A. General:

- a. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 - a. Comply with accessibility required mounting heights and horizontal locations.
 - b. Install the work of this Section in strict accordance with the manufacturer's recommendations as reviewed by the Architect, anchoring all units firmly into position square, plumb, straight and true.
 - c. Seal with backer rod and sealant for a watertight assembly at all penetrations through walls.
 - a. Refer to Section 07 92 00 – Sealants and Caulking
 - d. Seal with backer rod and sealant for a watertight assembly at all penetrations through Shower walls, floors and ceilings.
 - a. Refer to Section 07 92 00 – Sealants and Caulking
 - e. Install products with tamper proof mounting.
 - a. Provide exact type of concealed mounting device and fasteners required by conditions of installation.
 - 1) Products shall be complete with items necessary to provide secure mechanical attachment as approved. Attachment with adhesives not permitted.
- B. Provide and install grab bar manufacturers anchor plates for "in wall" anchor plates or approved equal for mounting specific manufacturer's grab bars.
- a. Bobrick 256 series "in-wall" anchor plates
 - b. Bradley "in-wall" anchor plates
 - c. Approved equal for mounting specific manufacturer's grab bars.

3.5 ADJUSTING

- A. Test operation of equipment, components, etc. and adjust as needed to produce fully functioning units that comply with requirements.
- B. Adjust all components to manufacturer's standards.
- C. Adjust such that all heights and clearances are met.

3.6 FIELD QUALITY CONTROL

- A. Product manufacturer shall provide field service support as requested by the Installer/Applicator
 - a. **General Contractor** and the product manufacturer shall make periodic on-site inspections to ensure that the materials are being installed in strict accordance with manufacturer's specifications.

- b. The Applicator shall be responsible for the proper application of the materials.
- B. The Applicator shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures and workmanship is in accordance with project specifications and manufacturer's instructions.

3.7 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - a. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 10 28 00

SECTION 10 44 00 – FIRE EXTINGUISHERS AND FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Coordinate the work of this Section with related trades.
- C. Verify applicable dimensions at the job site.
- D. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified herein and as necessary to complete the work required by project conditions, including but not limited to:
 - 1. Wall Recessed Fire Extinguisher cabinets and Fire Extinguishers:
 - a. As indicated on Drawings
 - b. As herein specified
 - 2. Bracket and Fire Extinguishers for wall mounting at the following rooms:
 - a. As indicated on Drawings
 - b. As herein specified
- E. Provide and install rated enclosure for all rated wall conditions.
- F. Provide and install Fire Extinguisher signage above all wall mounted fire extinguishers and Fire Extinguisher cabinets.
 - 1. Refer to Section 10 14 00 – Signage.

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 - 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. National Fire Protection Agency (NFPA), www.nfpa.org
 - 1. NFPA – 10 Table H.2
 - 2. NFPA – 13
- E. Underwriters Laboratory (UL), www.ul.com, www.ulstandardsinfoet.ul.com

1. UL 8 – Standard for Foam Fire Extinguishers
 2. UL 154 – Standard for Carbon Dioxide Fire Extinguishers
 3. UL 299 – Standard for Dry Chemical Fire Extinguishers
 4. UL 626 – Standard for 2-1/2 Gallon Stored-Pressure, Water-Type Fire Extinguishers
 5. UL 711 – Standard Rating for testing of Fire Extinguishers
 6. UL 1803 – Standard for Factory Follow-up on Third Party Certified Portable Fire Extinguishers
 7. UL 1093 – Standard for Halogenated Agent Fire Extinguishers.
 8. UL 2129 – Standard for Halocarbon Clean Agent Fire Extinguishers
- F. Conform to all applicable standards, local governing Fire Marshall & Building official for fire extinguisher types, sizes, locations and construction.
- G. Refer to standards herein listed with specific products/materials.

1.3 PERFORMANCE, TESTING AND INSPECTION

A. General:

1. Comply with manufacturer's standards.
2. Comply with Building Code.
3. Refer to Division 1 for additional requirements for DSA projects.

B. Standards:

Item	Name of Test	Performance	Testing Std.
Fire Extinguisher Agent	ABC, Multi-purpose dry-chemical	An effective agent in extinguishing class A, B, and C fires. The agent base is ammonium phosphate.	NFPA & UL
Fire Extinguisher Agent	<u>Dry-Chemical – BC</u>	An effective agent in extinguishing class B and C fires. The agent base is sodium bicarbonate.	NFPA & UL
Fire Extinguisher Agent	<u>Carbon Dioxide - CO²</u>	An effective agent in extinguishing class B and C fires. It will not contaminate nor leave residue on materials which it extinguishes.	NFPA & UL

		It is discharged as a white cloud of "snow" which smothers the fire by eliminating oxygen. It is a clean, odorless gas.	
Fire Extinguisher Agent	<u>Purple-K Dry-Chemical</u>	An effective agent in extinguishing class B and C fires. It is more effective than conventional dry-chemical agents. The agent base is potassium bicarbonate.	NFPA & UL
Fire Extinguisher Agent	<u>FFFP</u>	An effective agent in extinguishing class A and B fires. Superior to water in wetting and penetration. Aids in extinguishing deep-seated class A fires. An aqueous film forms and floats over the fuel surface in extinguishing class B fires. The agent base in Angus Alcoseal® Film Forming Fluoroprotein.	NFPA & UL
Refer to drawings and as herein specified			

C. Sustainability:

1. Refer to Division 1 sustainability requirements.
2. Refer to product criteria identified herein.

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements
- D. Submit Manufacturer's data and shop drawings
- E. Submit product data

- F. Submit installation instructions and drawings

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer / Fabricator shall have been in business for **five (5)** years providing / installing / finishing projects of similar size and complexity.
- C. Manufacturer shall have been in business for **five (5)** years providing/installing/finishing projects of similar size and complexity.
- D. Catalog Standards:
 - 1. Manufacturer's catalog numbers may be included on Drawings for convenience in identifying specified items. Unless modified by notation on Drawings or specified, catalog description for indicated number constitutes requirements for the item specified.
- E. Labeling
 - 1. The identification of the listing and labeling organization, the fire test, and the performance standard that the fire extinguisher meets or exceeds shall be clearly marked on each fire extinguisher.
 - 2. An organization listing fire extinguishers used to comply with the requirements of this standard shall utilize a third party certification program for portable fire extinguishers that meets or exceeds ANSI/UL 1803.
 - 3. Identification of Contents. A fire extinguisher shall have a label, tag, stencil, or similar indicator attached to it providing the following information:
 - a. The contents' product name as it appears on the manufacturer's Material Safety Data Sheet (MSDS)
 - b. Listing of the hazardous material identification in accordance with hazardous materials identification systems (HMIS) [in Canada, workplace hazardous materials identification systems (WHMIS)] developed by the National Paint & Coatings Association.
 - c. List of any hazardous materials that are in excess of 1.0 percent of the contents.
 - d. List of each chemical in excess of 5.0 percent of the contents.
 - e. Information as to what is hazardous about the agent in accordance with the Material Safety Data Sheet (MSDS).
 - f. Manufacturer's or service agency's name, mailing address, and phone number.
- F. Extinguishers
 - 1. The classification of fire extinguishers shall consist of a letter that indicates the class of fire on which a fire extinguisher has been found to be effective, preceded by a rating number (Class A and Class B only) that indicates the relative extinguishing effectiveness.

2. Fire extinguishers shall not be exposed to temperatures outside of the listed temperature range shown on the fire extinguisher label.

G. Fire Extinguisher Classifications Schedule

Fire Classifications			
	Class A Fires in wood, paper, cloth, trash and other ordinary combustibles	Class B Fires in Flammable liquids.	Class C Fires that involve energized electric equipment
Letter Symbol			
Picture Symbol			
Agents:	See Below	See Below	See Below
Multi-Purpose Dry- Chemical	Yes	Yes	Yes
Water	Yes	No	No
FFFP	Yes	Yes	No
Regular Dry-Chemical	No	Yes	Yes
Purple-K Dry Chemical	No	Yes - Kitchens	Yes - Kitchens
Carbon Dioxide	No	Yes	Yes

H. Miscellaneous criteria:

1. All units shall be portable, rechargeable fire extinguishers with stainless steel discharge lever and fixed carry handle.
 - a. Valve body shall be heavy-duty 'Dot' Steel cylinder.
 - b. All units shall have a short hose/horn unless specified otherwise and visual pressure gauge.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Deliver undamaged products to site in manufacturer's sealed containers or wrappings with legends intact. Store on site secure from weather, soil and physical damage.

1.7 JOB CONDITIONS

- A. Field-verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.

1.8 PROTECTION

- A. Protect finish surfaces at all times from surfaces and material adjacent to them.
- B. Finish work defaced with other materials on surface shall be replaced.

- C. Protect work under this section from damage by other trades.

1.9 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish one (1) year written warranty signed by manufacturer and installer agreeing to repair and/or replace cabinets, brackets and fire extinguishers which has failed as a result of defects in materials or workmanship.
- C. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.10 RELATED WORK / SECTIONS

- A. Related work includes, but is not limited to, the following:
 - 1. Wall Substrate
 - 2. Wall Framing
- B. Related Sections include, but are not limited to, the following:
 - 1. Division 1
 - 2. Section 09 22 16 – Non-Structural Metal Framing
 - 3. Section 09 29 00 – Gypsum Board & Sheathing Substrates
 - 4. Section 10 14 00 – Signage

1.11 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 - 1. Complete instructions regarding operation of the equipment.
 - 2. Complete instructions regarding maintenance of the equipment, materials, finishes, etc.
 - 3. Refer to Division 1 for closeout submittal procedures.

1.12 SEQUENCING AND SCHEDULING

- A. Schedule work and sequence with **General Contractor**.
- B. Coordinate scheduling of required testing with **General Contractor**.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer.
- B. Acceptable manufacturer shall be one of the following and as listed herein and in Drawings:
 - 1. Cabinets / Extinguishers:
 - a. Potter – Roemer, (800) 366–3473, www.potterroemer.com

- b. Larsen, (612) 571-1181, www.larsensmfg.com
 - c. J.L. Industries, (213) 726-9070, www.jlindustries.com
- 2. Signage: Refer to Section 10 14 00
- 3. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.
 - b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
 - c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS - FIRE EXTINGUISHER TYPES

A. Schedule:

1. Classrooms

- a. Rating: 3A:40B:C
- b. Manufacturer: Potter – Roemer
- c. Model: 3006 x 5" diameter x 16" tall
- d. Type: ABC Multi-purpose dry chemical
- e. Capacity: 6 lbs.
- f. Mounting: Cabinet:
 - 1) Match with options below for appropriate size accommodation
- g. FM Approved: Yes

2.3 MATERIAL - FIRE EXTINGUISHER CABINETS

A. <u>Semi Recessed</u>	Potter – Roemer	Potter – Roemer
1. Series:	7062 – DV	7067 – DV
2. Model:	Alta	Alta
3. Size: (inside cab)	9" wide x 24" tall x 5-3/4" deep	12" wide x 27" tall x 8" deep
4. Finish:	Stainless Steel, 304 - #4	Stainless Steel, 304 - #4
5. Door Style:	Duo-Vertical Panel	Duo-Vertical Panel
6. Glazing:	Obscure Tempered Safety	Obscure Tempered Safety

- | | | |
|-------------------------|---------------------------------|---------------------------------|
| 7. Lettering: | None | None |
| 8. Extinguisher type: | 3006 | 3352, 3410 |
| 9. Fire rated cabinet: | Yes – FRC option at rated walls | Yes – FRC option at rated walls |
| 10. Signage: | Refer to Signage specifications | Refer to Signage specifications |
| 11. Trim: | 2" deep 3" deep | |
| 12. Fin. Opening depth: | | |
| a. Non rated: | 4", verify with mfg. | 5-1/4", verify with mfgr. |
| b. Rated: | 4-7/8", verify with mfg. | 6-1/8", verify with mfgr. |

2.4 MATERIAL - FIRE EXTINGUISHER BRACKETS

A. Surface mounted bracket

- | | |
|------------------------------|-----------------|
| 1. Mount: | Wall |
| 2. Manufacturer: | Potter – Roemer |
| 3. Schedule: | |
| a. <u>Fire extinguisher:</u> | <u>Model:</u> |
| 1) 3306 | 3904 |
| 2) 3410 | 3904 |
| 3) 3352 | 3904 |
| 4. Finish: | Black |

2.5 MATERIAL - FIRE BLANKETS AND ACCESSORIES – Not Used

A. Application: Where indicated and at all stairs

B. Blanket:

- | | |
|------------------|-----------------------|
| 1. Manufacturer: | JL Industries |
| 2. Series: | Royal |
| 3. Size: | 62" x 84" x 3 1/2 lb. |
| 4. Material: | Wool fire blanket |

C. Cabinet:

- | | |
|------------------|-------------------------------|
| 1. Manufacturer: | JL Industries |
| 2. Model: | 2 FB drop type |
| 3. Const: | Metal cabinet and hinged door |
| 4. Color: | Red with "Fire Blanket" text |

2.6 MATERIAL - FIRE EXTINGUISHER SIGNAGE

A. Surface mounted Two-sided sign

1. Mount: On wall centered and directly above extinguisher / cabinet
2. Model: Refer to Section 10 14 00.

2.7 MATERIAL - DEFIBRILLATOR AND CABINET – Not Used

A. Defibrillator:

1. Mfgr: Philips
2. Model: HeartStart AED
3. Accessories:
 - a. Carrying Case
 - b. Defibrillator pads:
 - c. Training Video
 - d. Battery Pack

B. Cabinet:

1. Manufacturer: Potter – Roemer
2. Finish: Stainless Steel, 304 - #4
3. Type:
 - a. Semi-Recessed: HS 7023-D 16-1/2" x 24-1/2" x 6" overall
 - b. Surface: HS 7024-D 16" x 22" x 6"

PART 3 - **EXECUTION**

3.1 INSPECTION/EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

B. Surface:

1. Examine and verify that receiving conditions of substrate have no defects or errors, which would result in poor or potentially defective application or cause latent defects in workmanship.

3.2 COORDINATION

A. Refer to Division 1 for project coordination requirements.

- B. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

- A. Install in accordance with manufacturers instructions
- B. Install using fire rated cabinets at all fire rated walls.
- C. Install fire extinguishers in each classroom where indicated and/or approved by **Architect**.
- D. Install so that center of handle of fire extinguisher cabinet is 48" above finished floor line.
- E. Fire extinguishers mounted in cabinets or wall recesses shall be placed so that the fire extinguisher operative instructions face outward.
 - 1. The location of such fire extinguishers shall be marked conspicuously.

3.5 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.
- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
 - 1. Clean adjacent surfaces free of caulking or sealant with mechanical action or solvent as necessary, avoiding damage to other materials.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 10 44 00

SECTION 22 00 50 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Electric motors.
 - 2. Valve boxes.
 - 3. Gauges.
 - 4. Thermometers.
 - 5. Access Doors.
 - 6. Insulation.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 22 Section.

1.3 ADDITIONAL REQUIREMENTS

- A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.
- C. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems.

1.4 REFERENCES AND STANDARDS

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
 - 1. CSA – Canadian Standards Association International.
 - 2. ANSI - American National Standards Institute.
 - 3. ASTM - American Society for Testing and Materials.
 - 4. CCR - California Code of Regulations.
 - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.
 - 5. NCPWB - National Certified Pipe Welding Bureau.
 - 6. CEC - California Electrical Code.
 - 7. NEMA - National Electrical Manufacturers' Association.
 - 8. NFPA - National Fire Protection Association.
 - 9. OSHA - Occupational Safety and Health Act.
 - 10. UL - Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
 - a. California Building Code, 2022.
 - b. California Electrical Code, 2022.
 - c. California Energy Code, 2022.
 - d. California Fire Code, 2022.
 - e. California Green Building Standards Code, 2022.
 - f. California Mechanical Code, 2022.
 - g. California Plumbing Code, 2022.
 - h. California Code of Regulations, Title 24.
 - i. California Health and Safety Code.
 - j. CAL-OSHA.
 - k. California State Fire Marshal, Title 19 CCR.
 - l. National Fire Protection Association.
 - m. Occupational Safety and Health Administration.
 - n. Other applicable state laws.
2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

- A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.
- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
 1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.
 2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
 3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
 4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such

change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

- C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

- A. Obtain and pay for all permits and service required in installation of this work; arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.
- C. Coordination:
1. General:
 - a. Coordinate plumbing Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
 2. Electrical Coordination:
 - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
 - 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
 - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
 - 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
 3. Mechanical Coordination:
 - a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
 - b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
 - c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
 - d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural

features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

1.7 SUBMITTALS - GENERAL

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
 - 1. Partial or incomplete submittals will not be considered.
 - 2. Quantities are Contractor's responsibility and will not be reviewed.
 - 3. Provide materials of the same brand or manufacturer for each class of equipment or material.
 - 4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
 - 5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
 - 6. Organize submittals in same sequence as in Specification Sections.
 - 7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
 - a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
 - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
 - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
 - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
 - 1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

1.8 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Sustainable Design Submittals:
 - 1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
 - 2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
- D. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 11 68 75. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.
- E. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.
 - 1. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.
 - 2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
 - 3. Supports, anchorages and restraints for piping, ductwork, and equipment shall be an OSHPD pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
 - a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced

independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation. Pipe

- b.
 - c. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with California Building Code
4. Additional Requirements: In addition to the above, conform to all state and local requirements.

1.9 INFORMATIONAL SUBMITTALS

- A. Provide layouts for plumbing systems, for inclusion in coordinated layout specified in Section 23 80 00. Comply with requirements for layouts specified in Section 23 80 00.

1.10 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
 - 1. Refer to Division 01 for complete instructions.
 - 2. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
 - a. Sets shall incorporate the following:
 - 1) Product Data.
 - 2) Shop Drawings.
 - 3) Record Drawings.
 - 4) Service telephone number, address and contact person for each category of equipment or system.
 - 5) Complete operating and maintenance instructions for each item of plumbing equipment and systems.
 - 6) Copies of guarantees/warranties for each item of equipment and systems.
 - 7) Test data and system balancing reports.
 - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
 - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
 - 10) Control diagrams and literature.
 - 11) A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match

- schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
 - 12) Check test and start reports for each piece of plumbing equipment provided as part of the Work.
 - 13) Commissioning and Preliminary Operation Tests required as part of the Work.
 - b. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.
- B. Record Drawings:
- 1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
 - 2. Upon completion of the work, deliver to Architect the following:
 - a. Originals of drawings showing the Work exactly as installed.
 - b. One complete set of reproducible drawings showing the Work exactly as installed.
 - c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
 - d. Provide Contractor's signature, verifying accuracy of record drawings.
 - e. Obtain the signature of the Project Inspector for all record drawings.

1.11 SUBSTITUTIONS

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In the case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.
- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be all manufacturers other than those specifically listed in the Contract Documents by brand name, model or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
 - 1. Reason for substitution request.
 - 2. Complete submittal information as described herein; see "Submittals."
 - 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
 - 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
 - 5. Explanation of impact on connected utilities.
 - 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is the Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or

material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.

- G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

1.12 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with plumbing systems work similar to that required for this Project.
- C. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.
- D. Comply with applicable portions of California Plumbing Code pertaining to selection and installation of plumbing materials and products.
- E. All materials and products shall be new and shall match existing.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Protect equipment and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.

- C. On failure to comply with the warranty requirements within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

PART 2 - **PRODUCTS**

2.1 GENERAL

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. Refer to Sections 22 10 00 and 23 80 00 for specific system piping materials.

2.2 MATERIALS AND PRODUCTS

- A. No material installed as part of this Work shall contain asbestos.
- B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.3 ELECTRIC MOTORS

- A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. U.S. Motors.
 - b. Century Electric.
 - c. General Electric.
 - d. Lincoln.
 - e. Gould.
- B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
 - 1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.
- C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.

1. Multispeed motors shall have separate windings for each speed.
- D. Polyphase Motors with Additional Requirements:
 1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
 2. Motors Used with Variable Frequency Controllers:
 - a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - c. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
 - f. Each motor shall be provided with a shaft grounding device for stray current protection.
 3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.
- E. Single-Phase Motors:
 1. Select motors with service factor of 1.15.
 2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - a. Permanent-split capacitor.
 - b. Split phase.
 - c. Capacitor start, inductor run.
 - d. Capacitor start, capacitor run.
 3. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
 4. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
 5. Motors 1/20 HP and Smaller: Shaded-pole type.
- F. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 MOTOR STARTERS

- A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.
- B. Provide magnetic motor starters for equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.

1. All starters shall have the following:
 - a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
 - b. Ambient compensated thermal overload.
 - c. Fused control transformer (for 120 or 24 volt service).
 - d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIIR enclosures.
2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIIR enclosure for starters located outdoors.
4. Provide OSHA label indicating the device starts automatically.

2.5 VALVE BOXES

- A. General:
 1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular "vault" type adequately sized for condition and similar in construction to those specified above.
 2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
 3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.
- B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.
- C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.

2.6 GAUGES

- A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.
- B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

2.7 THERMOMETERS

- A. Marsh, Taylor, Palmer, or equal, 5 inch diameter bimetal dial, adjustable from face, with adjustable positioner, located to be easily read from normal personnel approach. Normal reading shall be at mid-scale.

1. Provide extension for insulation.
 2. Provide thermometers with steel bulb chambers and brass separable sockets.
- B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core, on inlet and outlet of each coil, boiler, and heat exchanger and provide two digital electronic test thermometers for each range of fluid temperature and where shown on Drawings.

2.8 ACCESS DOORS

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.
- E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
1. Milcor
 - a. Style K (plaster).
 - b. Style DW (gypsum board).
 - c. Style M (Masonry).
 - d. Style "Fire Rated" where required.

2.9 EQUIPMENT IDENTIFICATION

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

2.10 PIPE IDENTIFICATION

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legends and flow arrows shall conform to ASME A13.1.

2.11 INSULATION WORK

A. General:

1. For insulating domestic hot water pumps, refer to Section 22 50 00, Plumbing Equipment,
2. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
3. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
4. The term "piping" used herein includes pipe, valves, strainers and fittings.
5. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
6. Provide pre-formed PVC valve and fitting covers.
7. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
8. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.
9. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
10. Repair all damage to existing pipe and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.

B. Insulation of Piping:

1. Insulate domestic hot and tempered water with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness shall be the following:
 - a. Pipe 3/4 inches and smaller: 1 inch thick.
 - b. Pipe 1 inch through 1-1/2 inches: 1-1/2 inches thick.
2. Insulate domestic cold water piping located within building, outside of insulation envelope in outside walls, vented attic spaces, and unheated spaces, including equipment rooms and below raised floor with 1 inch thick molded fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
3. Insulate domestic cold water piping located outside building exposed to weather with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness for all pipe sizes: 2 inches.
4. Insulate condensate drain piping in freezer with 3/4 inch thick Therma-Cel, Armaflex, or equal. Seal water tight per manufacturer's directions. Install heat tape prior to insulation of piping, in accordance with manufacturer's directions.
5. Insulate electrically heat-traced grease waste piping under slab on grade with Owens Corning Foamglas, preformed pipe insulation, or equal. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Cover pipe and fittings with insulation manufacturer's recommended jacketing. Insulation thickness for all pipe sizes: 3 inches.

6. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor's option.

PART 3 - EXECUTION

3.1 EXISTING MATERIALS

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, pump or any other active energy source from piping or electrical service prior to abandoning in place.
- D. Existing piping, ductwork, and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

3.2 FRAMING, CUTTING AND PATCHING

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.
- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

3.3 PLUMBING DEMOLITION

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
 - 3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
 - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.4 ELECTRICAL REQUIREMENTS

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

3.5 PIPING SYSTEM REQUIREMENTS

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.6 PRIMING AND PAINTING

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. See Division 09 Painting Section(s) for detailed requirements.
- C. Priming and Painting:

1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
 - a. Black Steel Piping:
 - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
 - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

3.7 EXCAVATING

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.
- C. Maintain all warning signs, barricades, flares, and red lanterns as required.
- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of

Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

3.8 BACKFILLING

- A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.
- B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
 - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

3.9 PIPING SYSTEMS INSTALLATION

- A. At time of final connection, and prior to opening valve to allow pressurization of water piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi.
- B. pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.
- C. General:
 - 1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
 - 2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
 - 3. Install piping to permit application of insulation and to allow valve servicing.
 - 4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
 - 5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
 - 6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
 - 7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.

8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
10. Install horizontal valves with valve stem above horizontal.
11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
12. Verify final equipment locations for roughing-in.
13. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, CPC, and IAPMO installation standards. Anchor piping to building construction.
14. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.
15. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

D. Sleeves:

1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.

E. Floor, Wall, and Ceiling Plates:

1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

F. Firestopping:

1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
 - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.

2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

G. Flashing:

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
 - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
 - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.

H. Hangers and Supports:

1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers. Hanger and support components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide "bridging" support members firmly attached to building structural members in a fashion approved by the structural engineer.
 - a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
 - 1) Provide copper-plated or felt-lined hangers for use on copper tubing.
2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.

3. Riser clamps: B-line model B3373, or equal.
4. Pipe Hanger and Support Placement and Spacing:
 - a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 3)</u>	<u>Copper Brazed or Soldered (Note 3)</u>	<u>CPVC & PVC (Note 2)</u>
1/2 - 1"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2"	12 ft.	Each Floor, Not to Exceed 10 ft..	Base and Each Floor (Note 1)
2-1/2 - 3"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4"	12 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

- 1) Note 1: Provide mid-story guides.
 - 2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
 - 3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.
 - c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Thread- ed or Welded</u> (Note 2)	<u>Copper Brazen or Soldered</u> (Notes 2, 3)	<u>CPVC & PVC</u> (Note 1)
1/2 - 1"	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	4 ft.

- 1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
- 2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- 3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.
- d. Horizontal cast iron piping support spacing:
 - 1) Support piping at every other joint for piping length of less than 4 feet.
 - 2) For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
 - 3) Hanger shall not be installed on the coupling.
 - 4) Provide support at each horizontal branch connection.
 - 5) Provide sway brace at 40 foot maximum spacing for suspended pipe with no-hub joints, except where a lesser spacing is required by the seismic design criteria used in delegated design for seismic systems. Refer to Article, Submittals.
 - 6) Provide a brace on each side of a change in direction of 90 degrees or more.
5. Suspended Piping:
 - a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<u>Pipe Size</u>	<u>Rod Size Diameter</u>
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

- b. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.
 - c. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.
 - d. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.
 - e. Steel Connectors: Beam clamps with retainers.
6. Support to Structure:
- a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
 - 1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062---MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

- 2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
 - 3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.
 - b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.
7. Rubber Neoprene Pipe Isolators:

- a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
- b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
- c. Acceptable Suppliers:
 - 1) Vertical runs: Acousto-Plumb or equal.
 - 2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.
- 8. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
- 9. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
- 10. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.
- 11. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
- 12. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

3.10 UNION AND FLANGE INSTALLATION

- A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.
- B. Install unions in piping NPS 2" and smaller, and flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.
- C. Locate the unions for easy removal of the equipment, tank, or valve.

3.11 ACCESS DOOR INSTALLATION

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.12 PIPE PROTECTION

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:

1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
 - a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
 2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.
- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Rasor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.
- E. Sleeve copper piping/tubing installed below slab with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer's recommendations and instructions.
- F. Sleeve copper piping/tubing installed outside building below grade with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer's recommendations and instructions.
- G. Sleeve cast iron and ductile iron pipe below grade and below slab with "Polywrap" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 8 mils thick, colored natural. Install sleeve per manufacturer's recommendations and instructions.
- H. Covering: No rocks or sharp edges shall be backfilled against the wrap or sleeve. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.
- 3.13 PIPE IDENTIFICATION
- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.

- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Apply markings after painting and cleaning of piping and insulation is completed.

3.14 EXPANSION ANCHORS IN HARDENED CONCRETE

- A. Refer to Structural Drawings.
- B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.
- C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.
- D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.
- E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.15 PIPING SYSTEM PRESSURE TESTING

- A. General:
 - 1. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with fixtures and other appliances connected.
 - 2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- B. Piping Systems: Test piping systems in accordance with the following requirements and applicable codes:
 - 1. Authority having jurisdiction shall witness tests of piping systems.
 - 2. Notify Architect at least seven days in advance of testing.
 - 3. All piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
 - 4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.

5. Isolate from system equipment that may be damaged by test pressure.
6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.
 - a. Authority having jurisdiction shall witness final connection to system.
- C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.
- D. Testing of Sanitary Sewer, Drain, Vent, and Storm Drain may be done in segments in order to limit pressure to within manufacturer's recommendations. Test to 10 feet above highest point in the system.

<u>System Tested</u>	<u>Test Pressure PSI</u>	<u>Test With</u>
Sanitary Sewer, Drain, Vent	10 Ft. Hd.	Water
Storm Drain, Condensate Drains	10 Ft. Hd.	Water
Domestic Water	125	Water

1. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with the type of fluid conveyed by the piping system.

3.16 OPERATION OF SYSTEMS

- A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:
 1. Complete all requirements listed under "Check, Test and Start Requirements."
 2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
 3. Filters, strainers etc. are in place.
 4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
 5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

3.17 CHECK, TEST AND START REQUIREMENTS

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
 1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.

2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
 3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
 4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.18 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

- A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.
 2. Correct rotation of motors and ratings of overload heaters are verified.
 3. Specified filters are installed and spare filters have been turned over to Owner.
 4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
 5. All equipment has been cleaned, and damaged painted finishes touched up.
 6. Missing or damaged parts have been replaced.
 7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
 8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
 9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
 10. Preliminary test and balance work is complete, and reports have been forwarded for review.
 11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
 12. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.

1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.

C. Review of Contractor's Tests:

1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

D. Test Logs:

1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

E. Preliminary Operation:

1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

3.19 CERTIFICATES OF INSTALLATION

- A. Contractor shall complete applicable "Certificates of Installation" forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

3.20 DEMONSTRATION AND TRAINING

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
 1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
 2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
 3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
 - a. Listing of Owner-designated personnel completing training, by name and title.

- b. Name and title of training instructor.
 - c. Date(s) of training.
 - d. List of topics covered in training sessions.
4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION 22 00 50

SECTION 22 10 00 - PLUMBING PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings.
 - 2. Valves.
 - 3. Domestic water piping specialties.
 - 4. Drain and waste piping specialties.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing piping systems materials and products.

1.4 INFORMATIONAL SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.5 CLOSEOUT SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for plumbing piping systems materials and products. Include this data in Operation and Maintenance Manual.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

1.7 QUALITY ASSURANCE

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide materials and products complying with California Plumbing Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor's option.

- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Plastic piping components shall be marked with "NSF-pw."

2.2 PIPE AND FITTINGS ATTACHED TO AND BELOW BUILDINGS INCLUDING 5 FEET FROM BUILDINGS

- A. Piping and fittings attached to covered walkways and corridors shall comply with the requirements of this article.
- B. Drain and Waste Pipe Above Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard (CISPI) 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, vertical piping above floor from lavatories, sinks, and drinking fountains may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV weld pipe and fittings.
 - 1. Joints above grade: No-Hub pipe conforming to ASTM A888 and CISPI 301. Couplings conforming to ASTM 1277 and CISPI 310, with stainless steel bands. Provide products by ANACO-Husky, Tyler, Ideal or equal. Provide sway brace at 20'-0" maximum spacing for suspended pipe with No-Hub joints. Provide a brace on each side of a change in direction of 90 degrees or more. Brace riser joints at each floor and at 15 foot maximum intervals (also see Specification Section 22 00 50).
- C. Drain and Waste Pipe Below Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and CISPI 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, hub and spigot cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A-74 and so marked, may be used.
 - 1. Joints below grade: ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540.
 - 2. Joints below grade (hub and spigot option): Neoprene gaskets conforming to ASTM C564, as manufactured by Ty-Seal, Dual-Tite, or equal.
- D. Vent Pipe:
 - 1. 3 inch and larger: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe above grade.
 - 2. 2-1/2 inch and smaller: Cast iron soil pipe and fittings as specified for sizes 3 inch and larger, Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.
 - 3. Vent pipe buried in ground and to 6 inches above ground: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe below ground.
- E. Water Pipe (Tempered Water, Tempered Water Return, Hot Water, Hot Water Return and Cold Water): ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass. Water piping below slab: ASTM B88, Type K copper tubing, hard temper, with wrought copper fittings. At Contractor's option, pipe runs below slab having no branches may be ASTM B88, Type K

annealed copper tubing without joints. See Section 22 00 50 for pipe protection requirements for below slab copper piping.

- F. Temperature and Pressure Relief Valve Piping: ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass.

2.3 SITE PIPING AND FITTINGS TO 5 FEET FROM BUILDINGS

A. Buried Drain, Waste, and Vent Piping:

1. Install piping from street connection to the property line in accordance with local requirements.
2. 4 inches and larger: PVC, ASTM D3034 - SDR 35; use matching Ring Tite fittings.
3. 3 inches and smaller: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler pipe, or equal. Provide ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540. Pipe and fittings shall be the product of a single manufacturer.

B. Water Service Piping:

1. Sizes 2 inches and larger (not under building): Gasket style PVC conforming to ASTM D2241-SDR21, Class 200 with gasket type fittings or ductile iron mechanical joint couplings. Gasket fittings shall be one piece injection molded PVC fittings, equal to Flo-Seal water main fittings for PVC pressure pipe, 200 psi, ASTM D-3139.
2. Sizes less than 2 inches: Type K copper tubing, hard temper, with wrought copper fittings. See Section 22 00 50 for pipe protection requirements for below grade copper piping.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. J.M. Eagle.
 - b. P.W. Pipe.
 - c. Iplex Series Pipe.

C. Water Service Piping Above Grade:

1. Sizes 3 inches and larger: Class 150 flanged ductile cast iron water pipe conforming to AWWA/ANSI C150/A21.50 and manufactured in accordance with AWWA/ANSI C151/A21.51. Fittings shall conform to AWWA/ANSI C110/A21.10, Class 250 pattern. Pipe and fittings shall have factory applied cement-mortar lining in accordance with AWWA/ANSI C104/A21.4. Flanges shall conform to ASME/ANSI B16.1.
2. Piping 2-1/2 inches and smaller: Type K copper tubing, hard temper, with brazed wrought copper fittings.

2.4 PIPE JOINING MATERIALS

- A. Refer to piping Articles in this Section for special joining materials not listed below.
- B. Solder Filler Metals: ASTM B 32, 100 percent lead free alloys. Include water-flushable flux according to ASTM B813.

- C. Brazing Filler Metals: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
- D. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Solvent Cements for Joining CPVC Piping: ASTM F 493.
 - 1. CPVC solvent cement shall have VOC content of 490 g/L or less.
 - 2. Adhesive primer shall have VOC content of 550 g/L or less.
 - 3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
- F. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - 1. PVC solvent cement shall have VOC content of 510 g/L or less.
 - 2. Adhesive primer shall have VOC content of 550 g/L or less.
 - 3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

2.5 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS

- A. General:
 - 1. Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 11 68 75.
 - a. Provide valves listed to NSF/ANSI 61-G or NSF/ANSI 372 for valve materials for potable-water service.
 - 1) Exception: Main distribution gate valves above 1-1/2 inches located underground outside building are not required to conform lead-free requirements of California Health and Safety Code Section 11 68 75.
- B. Gate Valves:
 - 1. General: Furnish valves in copper lines with adapters to suit valve/line requirements.
 - 2. 1-1/2 inches and smaller: Minimum 200 psi CWP, bronze body, threaded bonnet, rising or non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Milwaukee UP148, UP149, Nibco T-113-LF, S-113-LF, or equal.
 - 3. 2 inches through 3 inches: Minimum 200 psi CWP, bronze body, threaded bonnet, non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Nibco T-113-LF, S-113-LF, or equal.
 - 4. Main distribution gate valves underground outside building above 1-1/2 inches:
 - a. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
 - 1) Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
 - 2) Furnish and deliver to Owner one wrench of each size required for operating underground valves.
- C. Ball Valves:

1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.
2. 2-1/2 inches: Apollo 77C-LF10, or equal.

D. Calibrated Balancing Valves:

1. General: Calibrated orifice ball type rated for 400 psig maximum operating pressure and 250 degrees F. maximum operating temperature.
 - a. Body: Brass.
 - b. Ball: 304 Stainless Steel.
 - c. Seat: Glass and Carbon filled TFE.
 - d. End Connections: Threaded.
 - e. Pressure Gage connections: Integral capped readout valves with internal check valves and drain port, for use with portable pressure differential meter.
 - f. Handle Style: Dial, with memory stops to retain set position.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. 3 Inch and Smaller: Bell & Gossett model CB, "LF" series.

2.6 VALVES AND FITTINGS FOR NON-POTABLE WATER.

A. Ball Valves:

1. 2 inches and smaller: 600 psi CWP, 150 psi SWP, cast bronze body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T585-70, Milwaukee BA-400, Stockham T-285, or equal.
2. 2-1/2 inches and larger: Class 150, carbon steel body, full port, two piece, stainless steel vented ball, flanged ends, and reinforced PTFE seal, conforming to MSS SP-72. Nibco F-515-CS-F-66-FS, Milwaukee F20-CS-15-F-02-GO-VB, or equal.

B. Calibrated Balance Valves (Symbol CBV): Provide globe style valves for precision regulation and control rated 175 psi for sizes 2-1/2 inches through 12 inches and rated 240 psi for bronze sizes 2 inches and below. Each valve shall have two metering/test ports with internal check valves and protective caps. All valves must be equipped with visual position readout and concealed memory stops for repeatable regulation and control.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Bell & Gossett Circuit Setter Plus.
 - b. Armstrong CBV.
 - c. Flow Design Inc. Accusetter.
 - d. Tour & Andersson.
 - e. Circuit Sensor with butterfly valve above 3 inches.
 - f. Illinois Series 5000 through 2 inches.

C. Flow Control Valves: Automatic pressure compensating flow control valves shall be Griswold, Flow Design, Inc., or equal.

2.7 DOMESTIC WATER PIPING SPECIALTIES

A. Hose Bibbs:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
 - a. Acorn Engineering Co.
 - b. Woodford Manufacturing Co.

B. Wall Hydrants:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
 - a. Acorn Engineering Co.
 - b. Woodford Manufacturing Co.
 - c. Mifab, Inc.

C. Water Hammer Arrestors:

1. Provide water hammer arrestors conforming to lead-free requirements of California Health and Safety Code Section 11 68 75, with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Water hammer arrestors shall be sized for type and number of fixtures served. Provide all stainless steel shell construction with stainless steel bellows and threaded connection to water system.
2. Water hammer arrestors shall be certified under P.D.I. Standard WH201 and by ASSE Standard 1010.
3. Select units in accordance with the requirements of Plumbing and Drainage Institute Standard P.D.I. WH201. Install above ceilings or behind wall access door at each plumbing fixture, or where plumbing fixtures are installed in groups, at each group of fixtures.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Josam Company, series 75000.
 - b. Smith (Jay R.) Mfg. Co., Hydrotrol 5005-5050.
 - c. Mifab, series WHB.

D. Potable Water Pressure-Regulating Valve:

1. Provide pressure-regulating valves, single-seated, direct-operated type, bronze body, integral strainer, complying with requirements of ASSE Standard 1003, and the lead-free requirements of California Health and Safety Code Section 11 68 75. Size for maximum flow rate and inlet and outlet pressure indicated on Drawings.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Cla-Val Company.
 - b. Watts Regulator Company.

E. Relief Valves:

1. Provide relief valves as indicated, of size and capacity as selected by Contractor for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
2. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI A21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F, and pressure relief at 150 psi.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Watts Regulator Company.
 - b. Cash (A.W.) Valve Manufacturing Corporation.
 - c. Zurn Industries, Inc.; Wilkins-Regulator Division.

F. Trap Primers:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
 - a. MiFab, Inc.
 - b. Precision Plumbing Products.
 - c. Sioux Chief Manufacturing Company.

2.8 DRAIN AND WASTE PIPING SPECIALTIES

A. Cleanouts:

1. General: Install cleanouts of same diameter as pipe (4 inch maximum) in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18 inches from building construction so as to provide sufficient space for rodding. No horizontal run over 50 feet inside buildings or 100 feet outside buildings shall be without cleanout, whether shown on Drawings or not. Provide two-way cleanouts where indicated on drawings, and where required for satisfactory use.
 - a. Provide cleanouts in waste drop from each sink and urinal.
 - b. Provide one wrench for each size and type of cleanout used. Turn over to Owner at completion of the project, and obtain receipt. Place receipt in Operation and Maintenance Manuals.
2. Cleanouts in floor and in concrete sidewalks: Ducco Cast Iron with nickel bronze top, clamping collar and ABS plastic plug: Zurn ZN-1400-KC, or equal, with square or round top to suit floor construction.
3. Cleanouts in composition floors: Zurn ZN-1400-X-DX, or equal (nickel bronze top).
4. Cleanouts in walls: Zurn Z-1441 or Z-1443, or equal, with stainless steel cover. Provide long sweep elbow or combination wye at connection to riser and install with surface of cleanout within ½ inch of front face of finished wall.
 - a. Where space does not permit the above installation, provide Zurn Z-1446, or equal, with stainless steel access cover, and vandal resistant screw.
 - b. Install face of cleanout plug within 1/2 inch of front face of finished wall.
5. Cleanouts exterior to building in landscaped areas: Zurn Z-1449-BP, or equal, cleanout ferrule with tapered bronze plug. Where located at grade, provide 18 by 18 by 6 inch concrete pad; Trowel concrete smooth and edge; set flush with finished grade.

B. Floor Drains:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
 - a. J.R. Smith.
 - b. MIFAB.
 - c. Watts.
 - d. Zurn.
- C. Floor Sinks:
 1. Floor Sinks: Provide anchoring flange (seepage pan) at all floor sinks, and provide flashing clamp in locations where floor membrane is used. Provide cast iron "P" trap and trap primer connection at P-Trap.
 2. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
 - a. J.R. Smith.
 - b. MIFAB.
 - c. Watts.
 - d. Zurn.

PART 3 - **EXECUTION**

3.1 EXAMINATION

- A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.
- B. Make all arrangements for the utilities required. Pay all costs involved in obtaining the services including meter, water meter, pressure reducing valve, access boxes, street work. Connect to site utilities. Verify the location of all services. No extra cost will be allowed if services are not as shown.
- C. Determine sanitary sewer and storm drain location and elevation at all points of connection before installing any piping. Notify Architect immediately if indicated grades cannot be maintained.
- D. At time of final connection, and prior to opening valve to allow pressurization of water piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

3.2 INSTALLATION OF WATER PIPING

- A. Run all water piping generally level, free of traps or unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work. No piping shall be installed so as to cause unusual noise from the flow of water therein under normal conditions.

- B. Provide manufactured water hammer arrestors, sized and installed in accordance with Plumbing and Drainage Institute Standard PDI WH201.
 - 1. Locate water hammer arrestors at every plumbing fixture, or, where fixtures are located in groups, at every group of fixtures, and as indicated on Drawings.
 - 2. Install water hammer arrestors above accessible ceilings, or install access doors for service.
- C. In freezing locations arrange water piping to drain as shown.
- D. Install piping on room side of building insulation.
- E. Check final location of rubber rings within couplings on PVC water piping with gauge or as recommended by manufacturer. Make connection to valves with cast iron adapters connected to water pipe with cast iron couplings. Furnish and install anchors or thrust blocks.

3.3 INSTALLATION OF SANITARY AND STORM DRAINAGE SYSTEMS

- A. Make joints in PVC sewer pipe with PVC-type couplings and rubber rings.
- B. Check final location of rubber rings within the couplings with gauge or as recommended by the manufacturer. Make joints between PVC pipe and cast iron pipe or fittings using cast iron adapter fittings, installed as recommended by the manufacturer.
 - 1. Ring-Tite cast iron pipe fittings may be used in lieu of standard fittings. Make connection to valves with cast iron adapters connected to the pipe with PVC couplings.
- C. Sewer Piping: Run all horizontal sanitary drain piping inside of building on a uniform grade of not less than 1/4 inch per foot unless otherwise noted or later approved. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.
- D. Run all drainage piping as straight as possible and provide easy bends with long turns; make all offsets at an angle of 45 degrees or less.
- E. Grade all vent piping so as to free itself quickly of any water condensation.
- F. Where possible, join groups of vent risers together with one enlarged outlet through roof. Maintain minimum of 10 foot horizontal or 3 foot vertical clearance from air intakes.
- G. Hubless Cast Iron Joints: Comply with coupling manufacturer's installation instructions.

3.4 PIPE JOINTS AND CONNECTIONS

- A. General:
 - 1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
 - 3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.
- B. Threaded Pipe: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- D. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 3. PVC Piping: Join according to ASTM D 2855.
- E. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.
 1. Soldered joints: Apply water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828.
- F. Cast Iron Soil Pipe:
 1. No-Hub fittings shall be made with a torque wrench.
 2. Hub joints shall be with Ty-Seal couplings.
 3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.
 4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified LOP reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.
- G. Welded Pipe:
 1. Make up with oxyacetylene or electric arc process.
 2. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
 3. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Thredolets, Nibco, or equal, may be used in lieu of welding tees.
- H. PVC Sewer and Drainage Pipe (outside building as allowed only): Four inches and larger shall be bell and spigot, assembled in accordance with manufacturer's recommendations. Joint shall be tested in accordance with ASTM D3212. Solvent weld joints below 4 inches in size, schedule 40 PVC with matching fittings, assembled per manufacturer's instructions.
- I. Polyethylene and Polypropylene Pipe: Assemble with fusion joints in strict accordance with manufacturer's instructions.

3.5 INSTALLATION OF VALVES

- A. Install valves as indicated on Drawings and in the following locations:
 1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.

2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.
3. Provide gate or globe valves on inlet and outlet of each water heater or pump.

B. General:

1. Valves shall be full line size unless indicated otherwise on Drawings.
2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
4. Locate valves for easy access and provide separate support where necessary.
5. Install valves in position to allow full stem movement.
6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
7. Butterfly valves conforming to the paragraph "Butterfly Valves" may be used in lieu of gate or globe valves for locations above grade.
8. Ball valves conforming to the paragraph "Ball Valves" may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.

C. Gate Valves:

1. Furnish valves in copper lines with adapters to suit valve / line requirements.
2. Underground gate valves:
 - a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
 - b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

- D. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers' recommendations, including requirements for straight pipe lengths at valve inlet and outlet.

3.6 INSTALLATION OF CLEANOUTS

- A. Cleanouts: Install in piping as indicated, as required by California Plumbing Code, at each change in direction of piping greater than 45 degrees. Install at maximum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping inside buildings, and at base of each conductor.
- B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water resistant membrane.

3.7 INSTALLATION OF FLOOR DRAINS AND FLOOR SINKS

- A. Install drains in accordance with manufacturer's written instructions and in locations indicated. Install floor drains with lip of drain slightly below finished floor to ensure drainage. Install floor sinks flush with finished floor. Coordinate with other trades to ensure that floor slopes to drain.

Provide flashing flange and clamping device with each drain passing through water resistant membrane.

- B. Install vented P-trap below each drain. Where trap primers are indicated, install trap primer connection in the P-trap.

3.8 TRAP PRIMER INSTALLATION

- A. Install as indicated in manufacturers printed literature, with 1/2 inch, Type L, hard copper piping to trap primer connection on floor drains and floor sinks where indicated on Drawings. At Contractor's option, Type K annealed copper tubing without joints may be used below slab only. See Section 22 00 50 for pipe protection requirements for below slab copper piping/tubing.
- B. Install trap primer piping with 1/4 inch per foot slope, to insure that the line will drain fully to the floor drain or floor sink.
 - 1. Provide ball valve to the inlet at each trap primer location.
- C. Install trap primer and distribution unit exactly as called for in manufacturers printed installation instructions. Connect to domestic water piping from the top of the water line, in order to prevent foreign material from entering directly into primer assembly.
- D. Mount trap primer in wall, in sheet metal box, with Karp or equal access door. Size access door and box to suit valve operation, and solder all seams of box. Seal all penetrations to box with non-hardening waterproof sealant. Provide locking door where installed in occupied spaces.
- E. Where one trap primer will be used for more than one trap, provide a distribution unit with feeder piping for a maximum of four traps sized for equal pressure drop to each trap.
 - 1. .

3.9 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system piping system to mechanical equipment as indicated, and provide with shutoff valve and union for each connection.

3.10 INSTALLATION OF HEAT TRACING

- A. Examination: Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.
- C. Electric Heating-Cable Installation for Flow Maintenance:
 - 1. Install electric heating cables after piping has been tested and before insulation is installed.

2. Install insulation over piping with electric heating cables according to Section 22 00 50 "Basic Plumbing Materials and Methods."
 3. Install warning tape on piping insulation where piping is equipped with electric heating cables.
- D. Junction boxes, thermostats, transformers and other system components shall not be attached to pipe insulation but shall be mounted on brackets fabricated of galvanized angle, channel or other material of sufficient strength to support components. Brackets shall be supported separately from pipes.
- E. Set field-adjustable switches and circuit-breaker trip ranges.
- F. Field Quality Control:
1. Perform insulation and continuity testing in accordance with cable manufacturers' recommendations at the following times:
 - a. Before cable installation.
 - b. Before connection kit installation.
 - c. After installing thermal insulation.
 2. Perform other tests recommended by cable manufacturer.
- G. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
1. Service representative shall perform final insulation resistance and continuity test, and other tests recommended by cable manufacturer.
- H. Demonstration and Training: Manufacturer shall provide one on-site 2-hour training session for Owners' maintenance personnel.
- I. All heat traced piping shall be insulated within 24 hours upon cable installation and acceptance. For insulation requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- J. Extra cable to be provided at piping specialties and fittings such as valves and flanges to allow dismantling and removal of equipment.
- 3.11 DOMESTIC WATER SYSTEM STERILIZATION
- A. Clean and disinfect new or altered hot and cold water piping connected to domestic water systems using methods prescribed by the Health Authority. If the Health Authority does not prescribe methods, clean and disinfect new or altered hot and cold water piping using methods given in the California Plumbing Code.
1. A water treatment company that has a current state EPA license to apply disinfectant chlorine in potable water shall perform the procedure.
- 3.12 CARE AND CLEANING
- A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Remove labels from stainless steel sinks, except 316 stainless steel sink labels should be retained to confirm that the correct material has been provided. Leave systems and equipment in satisfactory operating condition.

3.13 OPERATIONAL TESTS

- A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.14 TESTING AND BALANCING

- A. See Section 23 05 93 of Specifications for testing and balancing requirements.

3.15 CLEANING UP

- A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION 22 10 00

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Water supplies and stops.
 - 2. Plumbing fixture hangers and supports.
 - 3. Solids interceptors.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished.

1.4 INFORMATIONAL SUBMITTALS

- A. Refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.5 CLOSEOUT SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Plumbing Fixture Standards: Comply with applicable portions of the following codes and requirements for all work in this Section:
 - 1. California Building Code – CBC
 - 2. California Plumbing Code – CPC
 - 3. California Health and Safety Code
 - 4. American National Standards Institute - ANSI
 - 5. Federal Standards - F.S.
 - 6. National Sanitary Foundation – NSF International
- C. ANSI Standards: Comply with ANSI/NSF 61, "Drinking Water System Components – Health Effects."
- D. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.

- E. UL Labels: Provide water coolers that have been listed and labeled by Underwriters' Laboratories.
- F. ARI Labels: Provide water coolers that are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.
- G. Americans with Disabilities Act (ADA).
- H. California Green Building Standards Code Requirements:
 - 1. Tank-type water closets shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Tank-Type Toilets.

PART 2 - **PRODUCTS**

2.1 PLUMBING FIXTURES

- A. General: Provide factory fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete, installation. Where more than one type is dedicated, selection is Contractor's option; but, all fixtures of same type must be furnished by single manufacturer.
 - 1. Take special care with the roughing-in and finished plumbing where batteries of fixtures occur.
 - 2. Take location and mounting heights for roughing-in from Architectural Drawings.
 - 3. Follow schedule on Plumbing Drawings for roughing-in connections. Set roughing-in for all fixtures exactly as per measurements furnished by the manufacturers of the fixtures used.
 - 4. Roughing-in for lavatories and sinks shall be brought in through the wall under the centerline of the drain from the fixture wherever possible and as close to the fixture as possible.

2.2 MATERIALS

- A. Provide materials that have been selected for their surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.
- B. Where fittings, trim and accessories are exposed or semi-exposed, provide, chromium plated 17 gauge seamless brass and match faucets and fittings. Provide 17 gauge seamless copper or brass where not exposed.
- C. Handles on all faucets and stops shall be all metal chromium plated.
- D. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES

- A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated.
 - 1. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.
- B. P-Traps: Include IAPMO approved removable P-traps where drains are indicated for direct connection to drainage system. P-Traps shall be less trap screw cleanout, and incorporate a chrome plated cast brass body, brass connection nuts, 17 gauge seamless brass wall return and chrome plated wall escutcheon to match trap finish.
- C. Carriers: Provide cast iron supports for fixtures of graphitic gray iron, ductile iron, or malleable iron as indicated. Where the carrier for wall mounted water closets are installed more than 6 inches behind the finished wall, provide water closet support for wide pipe chase.
- D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed location, provide chrome-plated cast brass escutcheons with setscrews.
- F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction. Delete aerators where not allowed by CPC for health care occupancies.
- G. Comply with additional fixture requirements contained in Fixture Schedule shown on the drawings.

2.4 MANUFACTURERS

- A. In accordance with California Plumbing Code, provide indelibly marked or embossed manufacturers name or logo, arranged so as to be visible after installation.
- B. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:
 - 1. Vitrified China Plumbing Fixtures:
 - a. American Standard, U.S. Plumbing Products.
 - b. Eljer Plumbingware Div., Wallace-Murray Corp.
 - c. Kohler Co.
 - d. Vitra.
 - 2. Modular Lavatories:
 - a. Bradley.
 - b. Acorn.
 - c. Willoughby Industries, Inc.
 - 3. Plumbing Trim:
 - a. McGuire Manufacturing Co., Inc.
 - b. Delta Commercial.
 - c. Chicago Faucet Co.

- d. T&S Brass and Bronze Works, Inc.
- 4. Flush Valves:
 - a. Sloan Valve Co.
 - b. Zurn Industries, Hydromechanics Div.
 - c. Toto USA, Inc.
- 5. Faucets:
 - a. Chicago Faucet Co.
 - b. Symmons Scott.
 - c. T&S Brass and Bronze Works, Inc.
 - d. Delta Commercial.
- 6. Fixture Seats:
 - a. Church Seat Co.
 - b. Bemis Mfg. Co.
 - c. Beneke Corp.
- 7. Water Coolers and Drinking Fountains:
 - a. Haws Corporation.
 - b. Halsey Taylor Mfg. Co.
 - c. Elkay Mfg. Co.
 - d. Acorn Aqua.
- 8. Service Sinks:
 - a. American Standard.
 - b. Kohler Co.
 - c. Williams Serviceceptor.
 - d. Florestone.
 - e. Acorn.
- 9. Stainless Steel Sinks:
 - a. Elkay Mfg. Co.
 - b. Just Mfg. Co.
 - c. Haws Corporation.
- 10. Fixture Carriers:
 - a. Josam Mfg. Co.
 - b. J. R. Smith.
 - c. Tyler Pipe; Wade Div.
 - d. Zurn Industries; Hydromechanics Div.
 - e. Mifab, Inc.

2.5 FLUSH VALVE REQUIREMENTS

- A. Metering flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers' recommendations. All diaphragms are to have multiple filtered bypass and be chloramine resistant synthetic rubber with internal components suitable for 180 degree hot water to 150 pounds pressure, plastic or leather diaphragm not acceptable.
- B. Electronic flush valves where required and specified shall be non-hold open type with exposed parts chrome plated. Conform to all codes and manufacturers' recommendations. All diaphragms

are to have multiple filtered by pass and be chloramine and resistant synthetic rubber with rubber and internal components suitable for 180 degree hot water to 150 pounds pressure, plastic or leather diaphragm not acceptable. All flush valve solenoids and sensors shall be UL listed.

2.6 FIXTURE CONNECTIONS

- A. Make connection between fixtures and flanges on soil pipe absolutely gastight and watertight with neoprene type gaskets (wall hung fixtures) or bowl wax (floor outlet fixtures). Rubber gaskets or putty will not be permitted.
- B. Provide fixtures not having integral traps with P-traps of chromium-plated 17 gauge cast brass, with 17 gauge seamless brass wall return, connected to concealed waste in wall and sanitary fittings. Provide IAPMO approval for trap, and provide less trap screw cleanout.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Dearborn Brass, Commercial series with brass nuts.
 - b. Delta Commercial.
 - c. McGuire Manufacturing Co., Inc.
- C. Connections from stacks or horizontal wastes to wall or floor finish for wastes from lavatories, urinals, sinks, and drinking fountains and connection between floor drains and traps shall be IPS 85 percent red brass pipe.
- D. Plumbing fixture traps connected to special waste systems shall be constructed of materials to suit the waste system.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Orion.
 - b. Enfield
- E. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets. Traps shall rough in full size to waste and vent connection, using deep escutcheon plate to cover wall penetration. Compression adaptor extensions or sweat adaptors are not acceptable.

2.7 WATER SUPPLIES AND STOPS

- A. Provide 85 percent IPS threaded red brass nipple, conforming to the lead-free requirements of California Health and Safety Code Section 11 68 75, securely anchored to building construction, for each connection to stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have stop valves installed on water supply lines.
- B. Provide water supplies to fixtures with compression shut-off stops with threaded inlets and lock shield-loose key handles. Provide combination fixtures with compression stop and threaded inlet on each water supply fitting. Provide lock shield-loose key handle for each stop.
- C. Provide 1/2 inch riser tubes with reducing coupling for fixtures, unless otherwise noted.
- D. Provide cast brass escutcheon.
- E. Furnish shut-off valves on hose bibbs where directly connected to mains with no intervening valves.

F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. McGuire Manufacturing Company, Inc., model LFH2167LK.
2. T & S Brass and Bronze Works, Inc., model B-1305.

2.8 PLUMBING FIXTURE HANGERS AND SUPPORTS

- A. Floor-affixed supports for off-the-floor plumbing fixtures shall comply with ASME A112.6.1M.
- B. Residential type fixture supports are not acceptable.
- C. Install wall mounted water closets with combination support and waste fittings, with feet of support securely anchored to floor.
- D. Install floor mounted water closets with J.R. Smith, Zurn, or equal government pattern cast iron closet flanges with brass bolts, nuts, washers, and porcelain caps secured with Spackle.
- E. Install the following fixtures on concealed support with feet of support securely anchored to floor. Anchor top of support to wall construction in an approved manner.
 1. Wall hung lavatories.
 2. Wall mounted urinals.
 3. Drinking fountains.
 4. Electric water coolers.

2.9 PLUMBING FIXTURES

- A. Install all plumbing fixtures at height indicated on Architectural Drawings. Where mounting height is not indicated, install at height required by Code.
- B. Special Requirements For Accessible Fixtures:
 1. Operating handle or valve for accessible water closets, urinals, lavatories, and sinks shall operate with maximum 5 pounds force. Metering faucets shall be adjusted to operate between 10 and 15 seconds.
 2. Insulate exposed waste piping and domestic water supplies below accessible fixtures with CBC access code compliant molded "closed-cell" vinyl covers. Covers shall be installed using vandal resistant fasteners and must be removable. Covers shall meet flame spread rating not to exceed 25 and smoke density not to exceed 50 when tested in accordance with ASTM E-84, and shall comply with the requirements of California Code of Regulations, Title 24. Plumberex – Handy Shield, Johns Manville – Zeston 2000, or equal.

PART 3 - EXECUTION

3.1 PRODUCT HANDLING AND PROTECTION

- A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

3.2 PREPARATORY PROVISIONS

- A. The Contractor is responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section. Do not proceed until all

unsatisfactory conditions have been corrected. Commencing work will be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.3 INSPECTION AND PREPARATION

- A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.
- C. Fasten plumbing fixtures securely to supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies to blocking behind or within wall construction so as to be rigid, and not subject to pull or push movement.
- D. Install CBC accessible fixtures in accordance with Chapter 4 California Plumbing Code, and Chapters 11A and 11B California Building Code.
- E. Refer to Division 26 for wiring for electronic flush valves.

3.4 FAUCET INSTALLATION

- A. Provide 85 percent IPS red brass pipe, conforming to lead-free requirements of California Health and Safety Code Section 116875, securely anchored to building construction, for each connection to faucets, stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have a stop valve installed on water supply lines to permit repairs without shutting off water mains.
- B. Adjust metering faucets to run for 10 to 15 seconds.

3.5 CLEAN AND PROTECT

- A. Clean plumbing fixtures of dirt and debris upon completion of installation.
- B. Protect installed fixtures from damage during the remainder of the construction period.
- C. Grout voids between all fixtures and adjacent surfaces with white Dow Silicone Sealant, arranged to shed water.

3.6 FIELD QUALITY CONTROL

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

3.7 EXTRA STOCK

- A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten units.

END OF SECTION 22 40 00

SECTION 22 50 00 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Commercial electric water heaters.
2. Expansion tanks.
3. In-line domestic hot water recirculation pumps.
4. Insulation.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.3 ACTION SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, capacity and ratings, with selection points clearly indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.5 CLOSEOUT SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in Operation and Maintenance Manual.

1.6 QUALITY ASSURANCE

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Trade names or catalog numbers stated herein indicates grade or quality of materials desired.
- C. Dimensions, sizes, and capacities shown are minimum and shall not be changed without permission of Architect.
- D. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.
- E. Pump types and sizes regulated by the US Department of Energy's "Energy Conservation Standards for Pumps" 10 CRF Parts 429 and 431 shall be marked with a compliant PEI_{CL} or PEI_{VL} (Pump Energy Index, constant or variable load) value, basic model number, and RPM on the nameplate. Regulated

pumps shall be listed in the Hydraulic Institute (HI) Energy Rating database (er.pumps.org) and be assigned an Energy Rating as defined in the HI 40.5 program guide.

- F. CEC Compliance: Comply with California Electrical Code (Title 24, Part 3) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.
- G. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.
- H. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME Code symbol:
 - 1. Water Heaters 200 MBH and greater.
- I. California Energy Commission Compliance: Provide written confirmation of listing of all water heaters in the "Appliance Efficiency Database."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

1.8 WARRANTY

- A. Commercial Electric Water Heaters: Three-year minimum limited warranty on tank leakage.

PART 2 - **PRODUCTS**

2.1 MATERIALS

- A. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.
- B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.2 COMMERCIAL ELECTRIC WATER HEATERS

- A. General: Provide commercial electric water heaters of size, capacity, and electrical characteristics indicated on Drawings. Comply with ASHRAE 90.1 for energy efficiency. Provide UL listing. Relief valve dip tube shall extend to within 3 inches of tank.
- B. Heater: Working pressure of 150 psi, magnesium anode rod; glass lining on internal surfaces exposed to water.
- C. Heating Elements: Heavy-duty, medium watt density, with incoloy sheath or zinc plated copper, thermostat stepped through magnetic contactor.
- D. Safety Controls: Double-pole, manual-reset, high-limit, probe type electric water low water cutoff; both factory wired.
- E. Jacket: Equip with full size control compartments with front panel opening. Insulate tank with vermin resistant polyurethane or glass fiber insulation. Provide outer steel jacket with bonderized undercoat and baked enamel finish.

- F. Provide the following accessories:
 - 1. Brass drain valve.
 - 2. 3/4 inch temperature and pressure relief valve.
 - 3. Thermometer.
- G. Provide equal flow manifold for piping entering and leaving the water heaters. Manifold shall be provided as a standard option for the heaters proposed.
- H. Controls: Adjustable immersion thermostat or surface mounted therm-o-disc; power circuit fusing.
- I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1. Bradford White Corporation.
 - 2. Lochinvar Corporation.
 - 3. PVI Industries, LLC.
 - 4. Rheem Manufacturing Company.
 - 5. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.

2.3 EXPANSION TANKS

- A. Provide thermal expansion tanks of size and number as indicated on Drawings, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75. Construct tank of welded steel for working pressure of 125 psi. Provide specially compounded flexible diaphragm securely sealed into tank to permanently separate air charge from system water, to maintain design expansion capacity.
 - 1. Tanks shall be IAPMO approved and listed for use with domestic water systems.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1. Amtrol, Inc.
 - 2. A.O. Smith Water Products Company.
 - 3. Watts Water Technologies, Inc.

2.4 IN-LINE DOMESTIC HOT WATER RECIRCULATION PUMPS

- A. Provide lead-free in-line domestic water recirculation pumps where indicated on Drawings and of capacities as scheduled on Drawings. Pumps shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.
- B. Pumps shall be of the centrifugal type with non-overloading characteristics and shall not overload the motor above its nameplate horsepower rating under any operating condition. No allowance for service factor shall be used in pump selection. Motor horsepower shown is minimum; furnish larger motors if necessary to meet the non-overloading requirements.
- C. Type: Horizontal, designed for 125 thru 150 psi maximum working pressure and 225 degrees F continuous water temperature.
- D. Construction: Bronze casing, non-metallic impeller.
- E. Shaft: Ceramic, supported by carbon bearings. Bearings shall be lubricated by the pumped water.

- F. Motors shall have permanently lubricated ball bearings. Motors shall meet NEMA specifications. Motors shall have built-in thermal overload or impedance protection.
- G. Provide control wiring between field-installed controls, indicating devices, and pump control panels as work of this section, complying with requirements of Division 26 sections:
 - 1. Control wiring specified as work of Division 23 for Automatic Temperature Controls is work of that section.
- H. Wire pumps to mechanical control circuits to shut down pump when building is not occupied. Where no control system is installed, furnish pump manufacturers standard timer to automatically turn off circulating pump when hot water is not required.
- I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1. Grundfos Pumps Corporation.
 - 2. Bell & Gossett, ITT Corporation.
 - 3. Taco Incorporated.
 - 4. Armstrong Pumps, Inc.

2.5 INSULATION MATERIALS

- A. General:
 - 1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
 - 2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
 - 3. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
 - 4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
 - 5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
 - 6. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
- B. Insulation Materials:
 - 1. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) CertainTeed Corporation.
 - 2) Johns Manville.
 - 3) Knauf Insulation.
 - 4) Owens Corning.
- C. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Design Polymeric.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Knauf Insulation.
 2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 3. Service Temperature Range: 0 to plus 180 deg F.
 4. Color: White.
- D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Design Polymeric.
 - b. Childers Brand; H. B. Fuller Construction Products.
 - c. Foster Brand; H. B. Fuller Construction Products.
 - d. Knauf Insulation.
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: 0 to plus 180 deg F.
 4. Color: White.

PART 3 - **EXECUTION**

3.1 EXAMINATION

- A. The Contractor shall be responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section and shall not proceed until all unsatisfactory conditions have been corrected. Commencing work shall be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

3.2 ELECTRIC WATER HEATER INSTALLATION

- A. Install electric water heaters as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.
- B. Furnish wiring diagram to Electrical Installer. Refer to Division 26 for wiring of units, not work of this section.
- C. Connect to hot and cold water lines with shutoff valve, check valve, and dielectric union in the cold water line, and ASME standard pressure and temperature relief valve and dielectric union in the hot water line. Connect drain and relief piping as noted on Drawings.
- D. Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.
- E. After installation has been completed, seal bottom of heaters without feet to floor with silicone sealer.

3.3 PUMP INSTALLATION

- A. Install pumps where indicated, in accordance with manufacturer's published instructions, complying with recognized industry practices to ensure that pumps comply with requirements and serve intended purposes.
- B. Provide access space around pumps for service as indicated, but in no case less than that recommended by manufacturer.
- C. Install in-line pumps with support from overhead structure on each side of pump, or as indicated on Drawings.
- D. Support piping from the building structure so as to prevent any strain on the pump casings. Provide a final check for perfect alignment of the piping connections after pump has been secured to its base. Provide valves, accessories, gauges, flexible connections, and supports as indicated.
- E. Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
- F. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is complete and correct.
- G. Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer.
- H. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.
- I. Increase piping immediately at pump suction and discharge; flexible couplings and all valves shall be full line size.
- J. Trim pump impeller to obtain the desired water flow after installation, without cost to Owner.
- K. Pumps shall not be connected to piping before piping is thoroughly flushed and cleaned of all dirt and grit. After piping connections have been made, systems shall be filled before starting pumps. Pumps shall not be run dry under any circumstances.

3.4 INSULATION INSTALLATION

- A. Insulation Installation on Pumps:
 - 1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch- diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism. Do not enclose or insulate pump motor.
 - 2. Fabricate boxes from G90 galvanized steel, at least 0.050 inch thick.
 - 3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3.5 DEMONSTRATION AND TRAINING

- A. Provide a minimum of 8 hours of training and orientation of Owners staff in proper care and operation of Plumbing Equipment.

3.6 CARE AND CLEANING

- A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Leave systems and equipment in satisfactory operating condition.

3.7 OPERATIONAL TESTS

- A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

3.8 CLEANING UP

- A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

3.9 EQUIPMENT INSULATION SCHEDULE

- A. Domestic hot water recirculation pump insulation shall be the following:
 - 1. Mineral-Fiber Board: Thickness equal to insulation thickness for connected pipes and 3-lb/cu. ft. nominal density.

END OF SECTION 22 50 00

SECTION 23 00 50 - BASIC HVAC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Electric motors.
 - 2. Access Doors.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 23 Section.
- C. Refer to Section 23 08 00.13, T-24 Commissioning of HVAC for Title 24 commissioning requirements.

1.3 ADDITIONAL REQUIREMENTS

- A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services, including adequate heat and cooling, during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before disrupting services.
- C. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

1.4 REFERENCES AND STANDARDS

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
 - 1. AABC - Associated Air Balance Council
 - 2. AFBMA - Anti Friction Bearing Manufacturer's Association
 - 3. AMCA - Air Moving and Control Association Inc.
 - a. Standard 210 - Laboratory Methods of Testing Fans
 - 4. ANSI - American National Standards Institute
 - 5. ARI - Air-Conditioning and Refrigeration Institute
 - 6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
 - 7. ASME - American Society of Mechanical Engineers
 - 8. ASTM - American Society for Testing and Materials
 - 9. CCR - California Code of Regulations
 - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36
 - 10. CSA - Canadian Standards Association International
 - 11. CSFM - California State Fire Marshal
 - 12. NCPWB - National Certified Pipe Welding Bureau
 - 13. NIST - National Institute of Standards and Technology

14. NEMA - National Electrical Manufacturers' Association
15. NFPA - National Fire Protection Association
16. OSHA - Occupational Safety and Health Act
17. SMACNA - Duct Manuals
18. UL - Underwriters' Laboratories, Inc.

B. Requirements of Regulatory Agencies:

1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
 - a. California Building Code, 2019.
 - b. California Electrical Code, 2019.
 - c. California Energy Code, 2019.
 - d. California Fire Code, 2019.
 - e. California Green Building Standards Code, 2022.
 - f. California Mechanical Code, 2022.
 - g. California Plumbing Code, 2022.
 - h. California Code of Regulations, Title 24.
 - i. California Health and Safety Code.
 - j. CAL-OSHA.
 - k. California State Fire Marshal, Title 19 CCR.
 - l. National Fire Protection Association.
 - m. Occupational Safety and Health Administration.
 - n. Other applicable state laws.
2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

1.5 DRAWINGS

- A. Examine Drawings prior to bidding of work and report discrepancies in writing to Architect.
- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The HVAC Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
 1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over HVAC Drawings.
 2. Because of the small scale of HVAC Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
 3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.

4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.
- C. Execute work mentioned in the Specifications and not shown on the Drawings, or vice versa, the same as if specifically mentioned or shown in both.

1.6 FEES AND PERMITS

- A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
- C. Coordination:
 1. General:
 - a. Coordinate HVAC Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
 2. Have fire damper and fire smoke damper installation instructions available at Project site during construction for use by Project Inspector.
 3. Electrical Coordination:
 - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
 - 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
 - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
 - 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
 4. Mechanical Coordination:
 - a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
 - b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during construction.
 - c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
 - d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

1.7 SUBMITTALS - GENERAL

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
 - 1. Partial or incomplete submittals will not be considered.
 - 2. Quantities are Contractor's responsibility and will not be reviewed.
 - 3. Provide materials of the same brand or manufacturer for each class of equipment or material.
 - 4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
 - 5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
 - 6. Organize submittals in same sequence as in Specification Sections.
 - 7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
 - a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
 - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
 - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
 - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal as a complete package.

1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

1.8 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Sustainable Design Submittals:
 1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
 2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
- D. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration

1.9 INFORMATIONAL SUBMITTALS

- A. Provide coordinated layouts for HVAC Ductwork systems, in accordance with Specification Section 23 80 00.
- B. Provide evidence of equipment certification to California Energy Code Section 110.1 or 110.2, if not providing Electrically Commutated motors for HVAC fans sized below 1 hp and above 1/12 hp. Refer to specific equipment articles requiring electrically commutated motors.
- C. Check, Test, and Start forms, from equipment manufacturers.
- D. Check, Test and Start reports.

1.10 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
 1. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
 - a. Sets shall incorporate the following:
 - 1) Product Data.
 - 2) Shop Drawings.
 - 3) Record Drawings.
 - 4) Service telephone number, address and contact person for each category of equipment or system.
 - 5) Complete operating instructions for each item of heating, ventilating and air conditioning equipment.
 - 6) Copies of guarantees/warranties for each item of equipment or systems.

- 7) Test data and system balancing reports.
 - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
 - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
 - 10) Temperature control diagrams and literature.
 - 11) Check test and start reports for each piece of mechanical equipment provided as part of the Work.
 - 12) Commissioning and Preliminary Operation Tests required as part of the Work.
2. Post service telephone numbers and addresses in an appropriate place designated by Architect.
- B. Record Drawings:
1. Refer to Division 01 for additional requirements.
 2. Upon completion of the Work, deliver to Architect the following:
 - a. Originals of drawings showing the Work exactly as installed.
 - b. One complete set of reproducible drawings showing the Work exactly as installed.
 - c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
 - d. Provide Contractor's signature, verifying accuracy of record drawings.
 - e. Obtain the signature of the Inspector of Record for Record Drawings.

1.11 SUBSTITUTIONS

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.
- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be manufacturers other than those specifically listed in the Contract Documents by brand name, model, or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
 1. Reason for substitution request.
 2. Complete submittal information as described herein; see "Submittals."
 3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
 4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
 5. Explanation of impact on connected utilities.
 6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be

made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material, will not waive these requirements.

- G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

1.12 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of HVAC systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with HVAC systems work similar to that required for this Project.
- C. Comply with applicable portions of California Mechanical Code pertaining to selection and installation of HVAC materials and products.
- D. All materials and products shall be new.

1.13 DELIVERY, STORAGE, AND HANDLING

- A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

1.14 FIELD CONDITIONS

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

1.15 WARRANTY

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

PART 2 - **PRODUCTS**

2.1 GENERAL

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.
- C. Refer to Division 22 10 00 and 23 80 00 for specific system piping materials.

2.2 MATERIALS

- A. No material installed as part of this Work shall contain asbestos.
- B. California Green Building Code Compliance:
 - 1. HVAC and refrigeration equipment shall not contain CFCs.
 - 2. HVAC and refrigeration equipment shall not contain Halons.

2.3 ELECTRIC MOTORS

- A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. U.S. Motors.
 - b. Century Electric.
 - c. General Electric.
 - d. Lincoln.
 - e. Gould.
- B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
 - 1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.
- C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.
 - 1. Multispeed motors shall have separate windings for each speed.
- D. Polyphase Motors with Additional Requirements:
 - 1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

2. Motors Used with Variable Frequency Controllers:
 - a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - c. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
 - f. Each motor shall be provided with a shaft grounding device for stray current protection.
 3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.
- E. Single-Phase Motors:
1. Select motors with service factor of 1.15.
 2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - a. Permanent-split capacitor.
 - b. Split phase.
 - c. Capacitor start, inductor run.
 - d. Capacitor start, capacitor run.
 3. Motors for HVAC exhaust, transfer, and supply fans larger than 1/12 hp and smaller than 1 hp shall be the following:
 - a. Electronically Commutated motor (EC type): Motor shall be electronically commutated type specifically designed for applications, with heavy duty ball bearings. The motor shall be speed controllable down to 20% of full speed and 85% efficient at all speeds.
 - 1) Exceptions:
 - a) Motors in fan-coils and terminal units that operate only when providing heating to the space served.
 - b) Motors installed in space conditioning equipment certified under California Energy Code Section 110.1 or 110.2.
 4. Contractor's Option: Motors scheduled on Drawings as single-phase, and larger than 1/12 hp and smaller than 1 hp, for applications other than HVAC fans, may be EC type.
 5. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
 6. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
 7. Motors 1/20 HP and Smaller: Shaded-pole type.
 8. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.4 ACCESS DOORS

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
 - 1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Where panels are located on ducts or plenums, provide neoprene gaskets to prevent air leakage, and use frames to set door out to flush with insulation.
- E. Provide insulated doors where located in internally insulated ducts or casings.
- F. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.
- G. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
 - 1. Milcor
 - a. Style K (plaster).
 - b. Style DW (gypsum board).
 - c. Style M (Masonry).
 - d. Style "Fire Rated" where required.

2.5 EQUIPMENT IDENTIFICATION

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

2.6 PIPE IDENTIFICATION

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legend and flow arrow shall conform to ASME A13.1.

PART 3 - **EXECUTION**

3.1 EXISTING MATERIALS:

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become the property of Contractor and shall be removed from the Project site. Consult Owner before removing any material from the Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from the premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

3.2 FRAMING, CUTTING, AND PATCHING

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.
- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

3.3 MECHANICAL DEMOLITION

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
 - 3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible ductwork material.
 - 4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

5. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
 6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.4 ELECTRICAL REQUIREMENTS

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

3.5 PIPING SYSTEM REQUIREMENTS

- A. Drawing plans, schematic and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.6 PRIMING AND PAINTING

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. See Division 09 Painting Section(s) for detailed requirements.
- C. Priming and painting:
 1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
 - a. Black Steel Piping:
 - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
 - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
 - b. Interior Ductwork: Refer to Division 09 Painting Section(s). Architect shall select paint color.
 2. Metal surfaces of items to be jacketed or insulated except ductwork and piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other

deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.

3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

3.7 ACCESS DOOR INSTALLATION

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

3.8 PERATION OF SYSTEMS

- A. Do not operate any mechanical equipment for any purpose, temporary or permanent, until all of the following has been completed:
 1. Complete all requirements listed under "Check, Test and Start Requirements."
 2. Ductwork and piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
 3. Filters, strainers etc. are in place.
 4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
 5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.
- C. Operate every fire damper, smoke damper, combination smoke and fire damper under normal operating conditions. Activate smoke detectors as required to operate the damper, stage fan, etc. Provide written confirmation that all systems operate in a satisfactory manner.

3.9 CHECK, TEST AND START REQUIREMENTS

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of mechanical equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
 1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
 2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
 3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
 4. When work has been completed, provide copies of reports for review, prior to final observation of work.

- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each Operation and Maintenance Manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

3.10 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

- A. Prior to observation to determine final acceptance, put HVAC, plumbing, and fire protection systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
 - 1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations, including modulating power exhausts if present.
 - 2. Correct rotation of motors and ratings of overload heaters are verified.
 - 3. Specified filters are installed and spare filters have been turned over to Owner.
 - 4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
 - 5. All equipment has been cleaned, and damaged painted finishes touched up.
 - 6. Damaged fins on heat exchangers have been combed out.
 - 7. Missing or damaged parts have been replaced.
 - 8. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
 - 9. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
 - 10. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
 - 11. Preliminary test and balance work is complete, and reports have been forwarded for review.
 - 12. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
 - 13. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
 - 1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
 - 2. Include operation of heating and air conditioning equipment and systems for a period of not less than two 8 hour days at not less than 90 percent of full specified heating and cooling capacities in tests.
 - 3. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.

4. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
 5. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Before handing over the system to Owner replace all filters with complete new set of filters.
- D. Review of Contractor's Tests:
1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.
- E. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.
- F. Preliminary Operation:
1. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.
- G. Operational Tests:
1. Before operational tests are performed, demonstrate that all systems and components are complete and fully charged with operating fluid and lubricants.
 2. Systems shall be operable and capable of maintaining continuous uninterrupted operation during the operating and demonstration period. After all systems have been completely installed, connections made, and tests completed, operate the systems continuously for a period of five working days during the hours of a normal working day.
 3. This period of continuous systems operation may be coordinated with the removal of Volatile Organic Compounds (VOCs) from the building prior to occupancy should the Owner decide to implement such a program.
 4. Control systems shall be completely operable with settings properly calibrated and adjusted.
 5. Rotating equipment shall be in dynamic balance and alignment.
 6. If the system fails to operate continuously during the test period, the deficiencies shall be corrected and the entire test repeated.
- H. Pre-Occupancy Building Purge:
1. Prior to occupancy, ventilate the building on 100 percent outside air, 100 percent exhaust for a continuous period determined by a qualified industrial hygienist (engaged by the Contractor) to reduce V.O.C's prior to occupancy.
 2. Submit report by the industrial hygienist verifying satisfactory completion of the pre-occupancy purge.
- 3.11 DEMONSTRATION AND TRAINING
- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification

from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.

1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
 - a. Listing of Owner-designated personnel completing training, by name and title.
 - b. Name and title of training instructor.
 - c. Date(s) of training.
 - d. List of topics covered in training sessions.
4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION 23 00 50

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - 2. Balancing Domestic Water Piping Systems.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 REFERENCES AND STANDARDS

- A. Associated Air Balance Council (AABC)
 - 1. National Standards for Total System Balance, latest edition.
- B. National Environmental Balancing Bureau (NEBB)
 - 1. Procedural Standards for Testing and Balancing of Environmental Systems, latest edition.

1.4 DEFINITIONS

- A. The intent of this Section is to use the standards pertaining to the TAB specialist engaged to perform the Work of this Contract, with additional requirements specified in this Section. Contract requirements take precedence over corresponding AABC or NEBB standards requirements. Differences in terminology between the Specifications and the specified TAB organization standards do not relieve the TAB entity engaged to perform the Work of this Contract of responsibility from completing the Work as described in the Specifications.
- B. Similar Terms: The following table is provided for clarification only:

<u>Similar Terms</u>		
Contract Term	AABC Term	NEBB Term
TAB Specialist	TAB Agency	NEBB Certified Firm
TAB Standard	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems	Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems
TAB Field Supervisor	Test and Balance Engineer	Test and Balance Supervisor

- C. AABC: Associated Air Balance Council.
- D. NEBB: National Environmental Balancing Bureau.
- E. TAB: Testing, adjusting, and balancing.
- F. TAB Organization: Body governing practices of TAB Specialists.
- G. TAB Specialist: An entity engaged to perform TAB Work.

1.5 ACTION SUBMITTALS

- A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.

1.6 INFORMATIONAL SUBMITTALS

- A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.
- B. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
 - 1. Provide list of similar projects completed by proposed TAB field supervisor.
 - 2. Provide copy of completed TAB report, approved by mechanical engineer of record for a completed project with similar system types and of similar complexity.
- C. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
 - 1. Submit examinations report with qualifications data.
- D. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- E. Interim Reports. Submit interim reports as specified in Part 3. Include list of system conditions requiring correction and problems not identified in Contract Documents examination report.
- F. Certified TAB reports.
 - 1. Provide three printed copies of final TAB report. Provide one electronic file copy in PDF format.
- G. Sample report forms.
- H. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.
 - a. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if so recommended by instrument manufacturer and be checked for accuracy prior to start of work.

1.7 CLOSEOUT SUBMITTALS

- A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.
- B. Certified TAB reports, for inclusion in Operation and Maintenance Manual.

1.8 QUALITY ASSURANCE

- A. Independent TAB Specialist Qualifications: Engage a TAB entity certified by AABC or NEBB.
 - 1. The certification shall be maintained for the entire duration of TAB work for this Project. If TAB specialist loses certification during this period, the Contractor shall immediately notify the Architect and submit another TAB specialist for approval. All work specified in this Section and in other related Sections performed by the TAB specialist shall be invalidated if the TAB specialist loses certification, and shall be performed by an approved successor.
- B. To secure approval for the proposed TAB specialist, submit information certifying that the TAB specialist is either a first tier subcontractor engaged and paid by the Contractor, or is engaged and paid directly by the Owner. TAB specialist shall not be affiliated with any other entity participating in Work of this Contract, including design, furnishing equipment, or construction. In addition, submit evidence of the following:
 - 1. TAB Field Supervisor: Full-time employee of the TAB specialist and certified by AABC or NEBB.
 - a. TAB field supervisor shall have minimum 10 years supervisory experience in TAB work.
 - 2. TAB Technician: Full-time employee of the TAB specialist and who is certified by AABC or NEBB as a TAB technician.
 - a. TAB technician shall have minimum 4 years TAB field experience.
- C. TAB Specialist engaged to perform TAB work in this Project shall be a business limited to and specializing in TAB work, or in TAB work and Commissioning.
- D. TAB specialist engaged to perform TAB work shall not also perform commissioning activities on this Project.
- E. Certified TAB field supervisor or certified TAB technician shall be present at the Project site at all times when TAB work is performed.
 - 1. TAB specialist shall maintain at the Project site a minimum ratio of one certified field supervisor or technician for each non-certified employee at times when TAB work is being performed.
- F. Contractor shall notify Architect in writing within three days of receiving direction resulting in reduction of test and balance scope or other deviations from Contract Documents. Deviations from the TAB plan shall be approved in writing by the mechanical engineer of record for the Project.
- G. TAB Standard:
 - 1. Perform TAB work in accordance with the requirements of the standard under which the TAB agencies' qualifications are approved unless Specifications contain different or more stringent requirements:

- a. AABC National Standards for Total System Balance, or
 - b. NEBB Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
 2. All recommendations and suggested practices contained in the TAB standard are mandatory. Use provisions of the TAB standard, including checklists and report forms, to the extent to which they are applicable to this Project.
 3. Testing, adjusting, balancing procedures, and reporting required for this Project, and not covered by the TAB standard applicable to the TAB specialist engaged to perform the Work of this Contract, shall be submitted for approval by the design engineer.
- H. TAB Conference: Meet with Architect and mechanical engineer on approval of the TAB strategies and procedures plan to develop a mutual understanding of the project requirements. Require the participation of the TAB field supervisor. Provide seven days' advance notice of scheduled meeting time and location. TAB conference shall take place at location selected by Architect.
1. Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Coordination and cooperation of trades and subcontractors.
 - d. Coordination of documentation and communication flow, including protocol for resolution tracking and documentation.
 2. The requirement for TAB conference may be waived at the discretion of the mechanical engineer of record for the Project.
- I. Certify TAB field data reports and perform the following:
1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- J. TAB Report Forms: Use standard TAB specialist's forms approved by Architect .
- K. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.9 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.10 WARRANTY

- A. Provide workmanship and performance warranty applicable to TAB specialist engaged to perform Work of this Contract:
1. AABC Performance Guarantee.
 2. NEBB Quality Assurance Program.
- B. Refer to Division 01 Specifications for additional requirements.

1.11 COORDINATION

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.
- C. Coordinate TAB work with work of other trades.

PART 2 - **PRODUCTS (Not Applicable)**

PART 3 - **EXECUTION**

3.1 EXAMINATION

- A. Contract Documents Examination Report:
 - 1. TAB specialist shall review Contract Documents, including plans and specifications. Provide report listing conditions that would prevent the system(s) from operating in accordance with the sequence of operations specified, or would prevent accurate testing and balancing:
 - a. Identify each condition requiring correction using equipment designation shown on Drawings. Provide room number, nearest building grid line intersection, or other information necessary to identify location of condition requiring correction.
 - b. Proposed corrective action necessary for proper system operation.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine system pumps to ensure absence of entrained air in the suction piping.
- L. Examine operating safety interlocks and controls on HVAC equipment.
- M. Report conditions requiring correction discovered before and during performance of TAB procedures.
- N. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures. TAB plan shall be specific to Project and include the following:
 - 1. General description of each air system and sequence(s) of operation.
 - 2. Complete list of measurements to be performed.
 - 3. Complete list of measurement procedures. Specify types of instruments to be utilized and method of instrument application.
 - 4. Qualifications of personnel assigned to Project.
 - 5. Single-line CAD drawings reflecting all test locations (terminal units, grilles, diffusers, traverse locations, etc).
 - 6. Air terminal correction factors for the following:
 - a. Air terminal configuration.
 - b. Flow direction (supply or return/exhaust).
 - c. Effective area of each size and type of air terminal.
 - d. Air density.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Permanent electrical-power wiring is complete.
 - 2. Automatic temperature-control systems are operational.
 - 3. Equipment and duct access doors are securely closed.
 - 4. Balance, smoke, and fire dampers are open.
 - 5. Isolating and balancing valves are open and control valves are operational.
 - 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.

2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 80 00 Heating, Ventilating, and Air Conditioning."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Test each system to verify building or space operating pressure, including all stages of economizer cycle. Maximum building pressure shall not exceed 0.03 inches of pressure.
- C. Except as specifically indicated in this Specification, Pitot tube traverses shall be made of each duct to measure airflow. Pitot tubes, associated instruments, traverses, and techniques shall conform to ASHRAE Handbook, HVAC Applications, and ASHRAE Handbook, HVAC Systems and Equipment.
 1. Use state-of-the-art instrumentation approved by TAB specialists governing agency.
 2. Where ducts' design velocity and air quantity are both less than 1000 fpm/CFM, air quantity may be determined by measurements at terminals served.
- D. Test holes shall be placed in straight duct, as far as possible downstream from elbow, bends, take-offs, and other turbulence-generating devices.
- E. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- F. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- G. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- H. Verify that motor starters are equipped with properly sized thermal protection.
- I. Check dampers for proper position to achieve desired airflow path.
- J. Check for airflow blockages.
- K. Check condensate drains for proper connections and functioning.
- L. Check for proper sealing of air-handling-unit components.
- M. Verify that air duct system is sealed as specified in Section 23 80 00 "Heating, Ventilating, and Air Conditioning."
- N. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

- O. Automatically operated dampers shall be adjusted to operate as indicated in Contract Documents. Controls shall be checked for proper calibration.

3.5 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Efficiency rating.
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter manufacturer's name, model number, size, type, and thermal-protection-element rating.
 - a. Starter strip heater size, type, and rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.6 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each electric heating coil:
 - 1. Nameplate data.
 - 2. Airflow.
 - 3. Entering- and leaving-air temperature at full load.
 - 4. Voltage and amperage input of each phase at full load and at each incremental stage.
 - 5. Calculated kilowatt at full load.
 - 6. Fuse or circuit-breaker rating for overload protection.
- B. Measure, adjust, and record the following data for each refrigerant coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Wet-bulb temperature of entering and leaving air.
 - 3. Airflow.
 - 4. Air pressure drop.

3.7 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
 - 1. Measure and record the operating speed, airflow, and static pressure of each fan.
 - 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 - 3. Check the condition of filters.
 - 4. Check the condition of coils.
 - 5. Check the operation of the drain pan and condensate-drain trap.
 - 6. Check bearings and other lubricated parts for proper lubrication.
 - 7. Report on the operating condition of the equipment and the results of the measurements taken. Report conditions requiring correction.

- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
 - 1. New filters are installed.
 - 2. Coils are clean and fins combed.
 - 3. Drain pans are clean.
 - 4. Fans are clean.
 - 5. Bearings and other parts are properly lubricated.
 - 6. Conditions requiring correction noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
 - 1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
 - 2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
 - 3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
 - 4. Balance each air outlet.

3.8 GENERAL PROCEDURES FOR PLUMBING SYSTEMS

- A. Measure pressure drop across each backflow preventer assembly at design flows.
- B. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:
 - 1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Architect and comply with requirements in Section 22 50 00 "Plumbing Equipment
 - 2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
 - a. Monitor motor performance during procedures and do not operate motors in overload conditions.
 - 3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
 - 4. Report flow rates that are not within range given in article, Tolerances.
- C. Set calibrated balancing valves, if installed, at calculated presettings.

- D. Measure flow at all stations and adjust, where necessary, to obtain first balance.
 - 1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.
- E. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.
- F. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:
 - 1. Determine the balancing station with the highest percentage over indicated flow.
 - 2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
 - 3. Record settings and mark balancing devices.
- G. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.
- H. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.
- I. Check settings and operation of each safety valve. Record settings.

3.9 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent and minus 0 percent.
 - 2. Air Outlets and Inlets: Plus 5 percent and minus 5 percent.
 - 3. Multiple outlets within single room: Plus 5 percent and minus 0 percent for total airflow within room. Tolerance for individual outlets within a single room having multiple outlets shall be as for "Air Outlets and Inlets".
- B. Set plumbing systems water flow rates within plus or minus 10 percent.

3.10 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Interim Reports: Prepare periodic lists of conditions requiring correction and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing field supervisor. Report shall be co-signed by the

- Contractor, attesting that he has reviewed the report, and the report has been found to be complete and accurate.
2. The certification sheet shall be followed by sheet(s) listing items for which balancing objectives could not be achieved. Provide explanation for failure to achieve balancing objectives for each item listed.
 3. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Pump curves.
 2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Project Performance Guaranty
 6. Architect's name and address.
 7. Engineer's name and address.
 8. Contractor's name and address.
 9. Report date.
 10. Signature of TAB supervisor who certifies the report.
 11. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 12. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 13. Nomenclature sheets for each item of equipment.
 14. Data for terminal units, including manufacturer's name, type, size, and fittings.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Settings for supply-air, static-pressure controller.
 - g. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.

2. Duct, outlet, and inlet sizes.
 3. Pipe and valve sizes and locations.
 4. Balancing stations.
 5. Position of balancing devices.
- E. Air distribution outlets and inlets shall be shown on keyed plans with designation for each outlet and inlet matching designation used in Contract Documents and TAB test reports. Room numbers shall be included in keyed plans and test reports. Where multiple outlets and inlets are installed within a single room, a designation shall be assigned and listed for each outlet and inlet in addition to room number.
- F. Test Reports – General:
1. All test reports containing air or liquid flow data shall record flow values prior to system adjustment in addition to required data listed for each test report.
- G. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 3. Test Data (Indicated and Actual Values):
 - a. Total air flow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.

- k. Relief airflow in cfm.
 - l. Outdoor-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
 - m. Return-air damper position.
 - n. Relief-air damper position, normal and economizer, power exhaust, or power exhaust economizer modes, as applicable to installed equipment.
- H. Apparatus-Coil Test Reports:
- 1. Coil Data:
 - a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Fin spacing in fins per inch o.c.
 - f. Make and model number.
 - g. Face area in sq. ft.
 - h. Tube size in NPS.
 - i. Tube and fin materials.
 - j. Circuiting arrangement.
 - 2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Average face velocity in fpm.
 - c. Air pressure drop in inches wg.
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
 - e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Refrigerant expansion valve and refrigerant types.
- I. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
- 1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Coil identification.
 - d. Capacity in Btu/h.
 - e. Number of stages.
 - f. Connected volts, phase, and hertz.
 - g. Rated amperage.
 - h. Air flow rate in cfm.
 - i. Face area in sq. ft.
 - j. Minimum face velocity in fpm.
 - 2. Test Data (Indicated and Actual Values):
 - a. Heat output in Btu/h.
 - b. Air flow rate in cfm.

- c. Air velocity in fpm.
 - d. Entering-air temperature in deg F.
 - e. Leaving-air temperature in deg F.
 - f. Voltage at each connection.
 - g. Amperage for each phase.
- J. Fan Test Reports: For supply, return, and exhaust fans, include the following:
 - 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- K. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 - 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft.
 - g. Indicated air flow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual air flow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.

L. Air-Terminal-Device Reports:

1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft.
2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary air flow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final air flow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.

M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
2. Test Data (Indicated and Actual Values):
 - a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.

- f. Final discharge pressure in feet of head or psig.
- g. Final suction pressure in feet of head or psig.
- h. Final total pressure in feet of head or psig.
- i. Final water flow rate in gpm.
- j. Voltage at each connection.
- k. Amperage for each phase.

N. Instrument Calibration Reports:

- 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.12 INSPECTIONS

A. Initial Inspection:

- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
- 2. Check the following for each system:
 - a. Measure airflow of at least 10 percent of air outlets.
 - b. Measure water flow of at least 5 percent of terminals.
 - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
 - d. Verify that balancing devices are marked with final balance position.
 - e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect .
- 2. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect .
- 3. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- 4. If rechecks yield measurements that differ from the measurements documented in the final report by more than 10 percent, the measurements shall be noted as "FAILED."
- 5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contact the TAB specialists' governing organization for remedial action by the governing organization under the workmanship and performance warranty. See article, Warranty.
3. If remedial action is not provided by the TAB specialists' governing organization in a timely manner, Owner may contract the services of another TAB specialist to complete the TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB specialists' final payment.

D. Prepare test and inspection reports.

3.13 ADDITIONAL TESTS

- A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 08 00 - TITLE 24 COMMISSIONING OF HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for commissioning of HVAC systems for Title 24 (T-24) compliance.
- B. Scope: Commissioning Coordinator shall complete the building systems commissioning requirements of the California Energy Code, as applicable to Project. It is not the intention of Project specifications to require duplication in testing.
 - 1. T-24 commissioning activities may be coordinated with Contractor tests and TAB work specified in technical Sections.
 - 2. T-24 commissioning activities may be coordinated with LEED and CHPS program commissioning activities, as applicable to Project.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The requirements of this Section apply to all Sections of Division 23.
- C. In the event of conflict between requirements of Division 01 Title 24 commissioning specifications and this Section, Division 01 requirements shall prevail.

1.3 REFERENCES

- A. 2019 California Energy Code.
- B. 2019 California Energy Code and Building Energy Efficiency Standards Reference Appendices.
- C. 2019 Building Energy Efficiency Standards Nonresidential Compliance Manual.

1.4 DEFINITIONS

- A. Commissioning Coordinator: General Contractor, or an entity engaged by the General Contractor to perform T-24 commissioning.
- B. Covered Processes: Process equipment for which there are listed requirements in the California Energy Code.
- C. OPR: Owner's Project Requirements.
- D. TAB: Testing, Adjusting, and Balancing.

1.5 SUBMITTALS (FOR RECORD ONLY)

- A. Submit the following:
 - 1. Commissioning Plan.
 - 2. Systems Manual.
 - 3. Commissioning Report.
 - 4. Certificates of Installation.
 - 5. Certificates of Acceptance.

- B. Above items for inclusion in closeout documents submitted to authorities having jurisdiction.

PART 2 - **PRODUCTS**

2.1 TEST INSTRUMENTS

- A. Commissioning Coordinator shall supply test instruments. Instruments to be used for testing and balancing shall have been calibrated within a period of one year, or less if recommended by instrument manufacturer, and be checked for accuracy prior to start of work.

PART 3 - **EXECUTION**

3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES

- A. Architect/Engineer:
 - 1. Performs construction observation. Provides construction observation reports.
 - 2. Reviews and approves Commissioning Plan, Systems Manual, and Commissioning Report.
 - 3. Assists in problem resolution.
- B. Commissioning Coordinator:
 - 1. Coordinates commissioning process.
 - 2. Develops Commissioning Plan.
 - 3. Schedules and conducts functional testing. Completes Certificates of Acceptance.
 - 4. Assembles Systems Manual.
 - 5. Schedules and conducts systems operations training. Verifies systems operations training completion.
- C. HVAC Subcontractor: Assists in functional testing.
- D. Electrical Subcontractor: Assists in functional testing.
- E. Controls Subcontractor: Assists in functional testing.
- F. TAB Subcontractor: Assists in functional testing.
- G. Equipment Manufacturers/Vendors:
 - 1. Performs Check, Test, and Start of equipment and systems, as required by Project technical Sections.
 - 2. Provides systems and equipment documentation required to complete functional testing and assemble Systems Manual.

3.2 COMMISSIONING PLAN

- A. Commissioning Coordinator shall author the code-required Commissioning Plan. The Commissioning Plan shall address HVAC systems for which commissioning is required. The Commissioning Plan shall be updated by Commissioning Coordinator throughout the construction process. The Commissioning Plan shall contain the following:
 - 1. General Project Information: Commissioning Coordinator shall obtain general Project information from Project architectural Drawings.
 - 2. Commissioning Goals:
 - a. Verify that the applicable equipment and systems are installed in accordance with the contract documents and according to the manufacturer's recommendations.

- b. Verify and document proper integrated performance of equipment and systems utilizing functional testing for mechanical system acceptance, as required by the California Energy Code.
- c. Verify that Systems Manual documentation is complete.
- d. Verify that operating personnel are trained to enable them to operate, monitor, adjust, and maintain HVAC systems in an effective and energy-efficient manner.
- 3. Commissioning Coordinator shall compile the following information and include in Commissioning Plan:
 - a. An explanation of original design intent: Commissioning Coordinator shall obtain copies of the OPR and BOD for the Project.
 - b. Equipment and systems to be tested, including the extent of tests: Test 100 percent of a given type of installed equipment having associated Acceptance Requirements.
 - 1) Refer to forms MCH-01-E on Drawings for systems to be commissioned.
 - 2) Covered Processes: In addition to systems listed in MCH-01-E on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
 - a) Parking garage ventilation systems.
 - b) Compressed air systems.
 - c) Type 1 Kitchen exhaust systems.
 - c. Functions to be tested: Refer to 2019 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
 - d. Conditions under which the test shall be performed.
 - e. Measureable criteria for acceptable performance: Refer to 2019 Building Energy Efficiency Standards for Residential and Nonresidential Buildings, Nonresidential Appendix NA7.
 - f. Commissioning team information:
 - 1) Refer to Project information on architectural Drawings for design team participants. Commissioning Coordinator shall add subcontractor information to provided design team information and include in Commissioning Plan.
 - g. Commissioning process activities, schedules, and responsibilities. Plans for the completion of functional performance testing, systems operations training, and commissioning report.

3.3 CERTIFICATES OF INSTALLATION

- A. Commissioning Coordinator shall complete applicable Certificates of Installation forms.

3.4 FUNCTIONAL TESTING REQUIREMENTS

- A. Contractor shall complete the applicable Acceptance Requirements for Code Compliance contained in the California Building Energy Efficiency Standards. Refer to T-24 compliance forms on Drawings for systems having Acceptance testing requirements. Contractor shall perform Acceptance tests and complete the appropriate "Certificates of Acceptance." Contractor shall engage certified HERS Rater to verify duct leakage rate for duct systems indicated on T-24 compliance forms on Drawings as requiring duct leakage rate testing. For additional duct leak

testing requirements, refer to Section 23 80 00, "Heating, Ventilating, and Air Conditioning," Article, "Ductwork Sealing and Leak Testing."

1. Covered Processes: In addition to systems listed on T-24 compliance forms on Drawings, complete Acceptance Requirements for the following systems, if applicable to Project:
 - a. Parking garage ventilation systems.
 - b. Compressed air systems.
 - c. Type 1 Kitchen exhaust systems.

3.5 SYSTEMS MANUAL

- A. Commissioning Coordinator shall assemble Systems Manual in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division 01 specifications, including Section 01 79 00, Demonstration and Training, and commissioning specifications.

3.6 SYSTEMS OPERATIONS TRAINING

- A. Commissioning Coordinator shall provide systems operations training in accordance with the requirements of the California Energy Code, HVAC and Plumbing specifications, and Division 01 specifications, including Section 01 79 00, Demonstration and Training, and commissioning specifications.

3.7 COMMISSIONING REPORT

- A. Commissioning Coordinator shall complete Commissioning Report in accordance with the requirements of the California Energy Code and Division 01 commissioning specifications.

END OF SECTION 23 08 00.13

SECTION 23 80 00 - HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fans.
 - 2. Air inlets and outlets.
 - 3. Filters.
 - 4. Dampers.
 - 5. Ductwork.
 - 6. Insulation.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 23 00 50, Basic HVAC Materials and Methods.
- C. Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.
- D. Section 23 09 23, Direct Digital Control (DDC) System for HVAC.

1.3 ACTION SUBMITTALS

- A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.
- B. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, weight, corner or mounting point weights, furnished specialties and accessories; and installation and start-up instructions. Product data shall include applicable product listings and standards. Refer to Section 23 00 50, Basic HVAC Material and Methods for additional requirements.
- C. Engineering Data: Submit fan curves and sound power level data for each fan unit. Data shall be at the scheduled capacity. Data shall include the name of the rating agency or independent laboratory.

1.4 INFORMATIONAL SUBMITTALS

- A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.
- B. Roof Curb Data: For roof mounted equipment where combined weight of equipment unit and roof curb or rail exceeds 400 pounds, submit calculations from manufacturer for roof curbs proving compliance with the seismic requirements of the California Building Code, and ASCE 7-10. Manufacturer shall certify that roof curbs are suitable for use indicated on Drawings and in Specifications for the seismic design category indicated in structural Contract Documents. Calculations shall be stamped and signed by a State of California registered structural engineer.
- C. Economizer Fault Detection and Diagnostics (FDD) System Data: For all air-cooled unitary direct-expansion units equipped with an economizer, provide data for third-party supplied California Energy Commission certified FDD controller, documenting compliance with the requirements of California Building Energy Efficiency Standards. Provide evidence of certification.

- D. Record of pre-installation meeting.
- E. Coordinated Layouts: Submit coordinated layouts. For requirements refer to article, Coordinated Layouts, in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. For additional requirements, refer to Section 23 00 50, Basic HVAC Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts list for each piece of equipment, control, and accessory; including "trouble-shooting guide," in Operation and Maintenance Manual.
- C. Record Drawings: Submit Record Drawings of installed ductwork, duct accessories, and outlets and inlets in accordance with requirements of Division 01.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Belts: One set(s) for each belt-driven unit.
 - 2. Provide one complete set(s) of filters for each filter bank.

1.7 COORDINATED LAYOUT

- A. Coordinated layouts are required to amplify, expand and coordinate the information contained in the Contract Documents.
- B. Provide minimum 1/4 inch equals one foot scaled coordinated layout drawings showing plan and pertinent section or elevation views of piping, ductwork, equipment, accessories, and electrical systems. Drawings shall be reproducible and work of each trade represented shall be fully coordinated with structure, other disciplines, and finished surfaces. Drawings shall be presented on a single size sheet. Coordinated layout drawings shall have title block, key plan, north arrow and sufficient grid lines to provide cross-reference to design Drawings.
 - 1. Provide a stamp or title block on each drawing with locations for signatures from all contractors involved, including but not limited to the General, HVAC, Plumbing, Fire Protection, and Electrical contractors. Include statement for signature that the contractor has reviewed the coordinated layout drawings in detail and has coordinated the work of his trade.
 - 2. Show on drawings the intended elevation of all ductwork in accordance with the following example:
B.O.D. = 9'-0"
OFFSET UP 6"
B.O.D. = 9'-6"
 - 3. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the coordinated layouts. Architect will not be responsible for identifying deviations from the original Contract Documents.
- C. Since scale of contract drawings is small and all offsets and fittings are not shown, Contractor shall make allowances in bid for additional coordination time, detailing, fittings, offsets, hangers and the like to achieve a fully coordinated installation. If changes in duct size are required, equivalent area shall be maintained and the aspect ratio shall not be in excess of 2 to 1 unless approved by the

engineer. Drawings shall be submitted for review prior to fabrication and installation. Drawings may be submitted in packages representing at least one quarter of the building ductwork.

- D. Check routing on all ductwork before fabricating. Report any discrepancies to Architect. No extra cost will be allowed for failure to conform to above.

1.8 QUALITY ASSURANCE

A. Design Criteria:

1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture. All gas-fired equipment shall be UL, ETL or CSA listed.
2. Supply all equipment and accessories in accordance with requirements of applicable national, state and local codes.
3. All items of a given type shall be products of the same manufacturer.
4. Scheduled equipment performance is minimum capacity required.
5. Scheduled electrical capacity shall be considered as maximum available.
6. Scheduled gas BTU input shall be considered as maximum available.

1.9 FIELD CONDITIONS

- A. Interruption of Existing Services: Do not interrupt services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services according to requirements indicated:
1. Notify Architect no fewer than two days in advance of proposed interruption of services.
 2. Do not interrupt services without Architect's written permission.

1.10 WARRANTY

- A. Air Conditioning Unit, Roof-Mounted:
1. Compressor shall have a five-year warranty.
 2. Standard heat exchanger shall have a ten-year warranty.
- B. Heat Pump Unit, Roof-Mounted: Compressor shall have a five-year warranty.
- C. Heating and Ventilating Unit: Heat exchanger shall have minimum 10-year warranty.
- D. Air Cooled Condensing Unit: Unit shall have 5-year limited compressor warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

2.2 FANS

- A. All fans shall be Air Moving and Control Association Inc. (AMCA) labeled.
- B. Provide self-aligning, enclosed ball bearings, accessible for lubrication unless specified otherwise.
- C. Provide variable speed switch for all direct drive fans.

D. In-Line Centrifugal Fans:

1. Centrifugal fan with airfoil blades, aluminum or steel housing, externally mounted belt-drive motor, external lube tubes, integral support brackets.
2. Provide sloped roof or flat roof type roof cap, or wall cap to suit the location indicated on the Drawings.

E. Fan Drives:

1. Drive Design: The design horsepower rating of each drive shall be at least 1.5 times, single belt drives 2 times, the nameplate rating of the motor with proper allowances for sheave diameters, speed ratio, arcs of contact and belt length.
2. Provide variable speed drives, Dayco, Browning, Woods, or equal. Allow for replacement of fan and motor drives and belts as required to suit the balance requirements of the project.
3. Select variable speed drives to allow an increase or decrease of minimum of ten percent of design fan speed.

F. Motors:

1. Motors of 25 HP and less shall have adjustable pitch sheaves; sheaves on motors above 25 HP may be non-adjustable. Change, at no extra cost to Owner, the non-adjustable sheaves to obtain desired air quantities.
2. For single-phase fan motors sized larger than 1/12 hp and smaller than 1 hp, refer to Article, Electric Motors, in Section 23 00 50, Basic HVAC Materials and Methods.

G. Sheaves: Sheaves shall be cast or fabricated, bored to size or bushed with fully split tapered bushings to fit properly on the shafts. All sheaves shall be secured with keys and set screws.

H. Belts:

1. All belts shall be furnished in matched sets.
2. Belts shall be within 1 degree 30 minutes of true alignment in all cases.

I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. PennBarry.
4. American Coolair Corporation.

J. Owner Training: Manufacturer shall provide one on-site 1-hour training session for Owners' maintenance personnel.

2.3 AIR INLETS AND OUTLETS

- A. Except as otherwise indicated, provide manufacturer's standard inlets and outlets where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Ceiling, wall or floor Compatibility: Provide inlets and outlets with border styles that are compatible with adjacent ceiling, wall or floor systems, and that are specifically manufactured to fit into ceiling, wall or floor module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems that will contain each type of air outlet and inlet.
- C. Refer to Schedule on Mechanical Drawings for details of inlets and outlets to be used.

2.4 AIR FILTERS

- A. Provide MERV 13 disposable pleated media type. Refer to specific equipment Articles for filter depth and for exceptions to this specification. Filters shall conform to the following:
 - 1. Standards:
 - a. ASHRAE Standard 52.2-2007.
 - b. Underwriters Laboratories: U.L. 900, Class 2.
 - 2. Construction:
 - a. Media: Synthetic or cotton-synthetic blend with radial pleats.
 - b. Media Frame: High wet-strength beverage board.
 - c. Media Support: Welded wire or expanded metal grid bonded to air leaving side of the media.
 - 3. Performance: 2" deep filter shall have a maximum initial air resistance of 0.31 inches w.g.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1. Camfil Farr, Inc., model 30/30.
 - 2. Flanders Corporation, model 40 LPD.
- C. Temporary (Construction Period) Filters:
 - 1. Install new temporary filters in all units that have filter systems installed. Temporary filters shall match the permanent filters that are specified for the units. Replace filters as needed, in accordance with manufacturer's directions, in order to provide protection for the unit prior to occupancy by the Owner.
 - 2. If air handling units are operated during construction of the project, install temporary filters directly over each return air inlet. Filters shall match the permanent filters that are specified for the units. Select size of filter to completely cover the frame of the return air inlet, and tape filters firmly in place to eliminate any construction debris from entering the duct system or unit. Remove the temporary filters upon completion of the work, and repair all damaged paintwork.
- D. Spare Filters:
 - 1. Furnish two new, complete sets of filter cartridges for each filter bank on completion and acceptance of the work. Install one set of filters in units (prior to final air balance). Provide units designed to accommodate washable, permanent filters with one washable, permanent filter.

2.5 DAMPERS

- A. Backdraft Dampers: Ruskin CBD2, counterbalanced, Nailer Industries, or equal.
- B. Manual Air and Balance Dampers: Provide dampers of single blade type or multi-blade type constructed in accordance with SMACNA, "HVAC Duct Construction Standards," except as noted herein.
 - 1. Rectangular Ductwork:
 - a. Single damper blades may be used in ducts up to 10 inches in height. Dampers shall be 16 gauge minimum. Provide self-locking regulators, equal to Ventlok 641. Provide end bearings equal to Ventlok 607 at each damper. Provide continuous solid 3/8 inch square shafts.

- b. Multiple blade dampers shall be equal to Ruskin CD35 Standard Control Damper. Maximum width for multiple damper blades for use in rectangular duct shall not exceed 6 inches.
 - c. Where duct velocity may be expected to exceed 1500 fpm, provide Ruskin CD-50, or equal, low leakage dampers with airfoil blades.
- 2. Round Ductwork:
 - a. Single damper blades may be used in ducts up to 12 inches in diameter. Provide multiple blade opposed blade dampers, with connected linkage, for ductwork larger than 12 inches in diameter.
 - b. Damper blades for round ductwork shall be 20 gauge steel for ducts up to 12 inches diameter and 16 gauge steel for dampers larger than 12 inches damper. Provide self-locking regulators, equal to Ventlok 641, Durodyne, or equal for operation of dampers. Provide end bearings equal to Ventlok 607 and provide continuous solid 3/8 inch square shafts.
- 3. Where ductwork is externally insulated, provide self-locking regulators equal to Ventlok 644, Durodyne, or equal for rectangular ductwork, and Ventlok 637, Durodyne, or equal for round ducts.

2.6 DUCTWORK

- A. Construct and install sheet metal ductwork in accordance with the California Mechanical Code for 2 inches static pressure for supply air, and 2 inches minimum for return and exhaust air unless otherwise noted on Drawings.
 - 1. Where not in conflict with the California Mechanical Code, construct and install all sheet metal ductwork in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible). Where applicable for HVAC work, construct and install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual.
 - 2. Provide variations in duct size, and additional duct fittings as required to clear obstructions and maintain clearances as approved by the Architect at no extra cost to the Owner.
 - 3. Gauges, joints and bracing shall be in accordance with the California Mechanical Code.
 - 4. Provide beading or cross breaking for all ductwork inside building. Provide cross breaking for ductwork exposed to weather.
 - 5. At the contractor's option, ductwork may be fabricated using the Ductmate, Nexus, Quickduct, Transverse Duct Connection (TDC), Pyramid-Loc duct connection systems, or equal. Fabricate in strict conformance with manufacturer's written installation instructions and in accordance with California Mechanical Code.
 - a. Seal flanged ends with pressure sensitive high density, closed cell neoprene or polyethylene tape gasket, Thermo 440, or equal.
 - b. Provide metal clips for duct connections, except at breakaway connections for fire dampers and fire smoke dampers. Provide corner clips at each corner of duct, through bolted, at all locations except at breakaway connections for fire dampers and fire smoke dampers. Where used on locations exposed to weather, provide continuous metal clip at top and sides of duct, with 1 inch overhang for top side.
- B. Design and installation standards:
 - 1. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) for all work in this section.

2. NFPA Compliance: Comply with ANSI/NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," and ANSI/NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."
 3. California Mechanical Code.
- C. Duct sizes indicated are external sizes.
- D. Galvanized Sheet Steel: Lock-forming quality, ASTM A924 and ASTM A653, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.
1. Provide mill certification for galvanized material at request of the Project Inspector.
- E. Duct Sealants:
1. Sealant shall have a VOC content of 250 g/L or less.
 2. Sealant shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
 3. Provide one part, non-sag, synthetic latex sealant, formulated with a minimum of 68 percent solids. Sealant shall comply with ASTM E84, Surface Burning Characteristics.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) Design Polymerics, model DP1010.
 - 2) Polymer Adhesive Sealant Systems Inc, model Airseal #11.
 - 3) McGill Airseal, LLC.
- F. Duct Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, straps, trim, and angles for support of ductwork.
- G. Rectangular Duct Fabrication:
1. Shop fabricate ductwork of gauges and reinforcement complying with the more stringent of the following standards, except as noted herein.
 - a. SMACNA HVAC Duct Construction Standards
 - b. California Mechanical Code
 2. Fabricate ducts for 2 inch pressure class with minimum duct gauges and reinforcement as follows, except as otherwise noted:

<u>Table A</u>		
<u>Duct Dimension</u>	<u>Minimum Gauge</u>	<u>Joint Reinforcement Per CMC</u>
Through 12"	26	Not Required
13" through 18"	24	Not Required
19" through 30"	24	C/4
31" through 42"	22	E/4

3. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Fabricate to include single thickness turning vane in elbows where space does not permit the above radius or where square elbows are shown. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers. Turning vanes shall be E-Z Rail II, Durodyne, or equal.
 4. Fabricate round supply connections at rectangular, plenum type fittings using spin-in type fittings, complete with extractor and volume control damper. Refer to Paragraph "DAMPERS" for damper requirements.
 5. Provide drive slip or equivalent flat seams for ducts exposed in the conditioned space or where necessary due to space limitations. On ducts with flat seams, provide standard reinforcing on inside of duct. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
 6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
 7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.
- H. Rectangular Internally Insulated Duct Fabrication:
1. Provide internal duct lining where indicated on the Drawings, with a minimum of 10'-0" length in each direction from the fan, fan casing, or unit casing. Line all transfer ducts.
 - a. Where ductwork is exposed to weather or outside the building insulation envelope, provide 2 inch thick, 1-1/2 pound density internal lining with matte facing, with an R-Value of 8.0 minimum.
 - b. Where ductwork is within the building insulation envelope, lining shall be 1" thick, 1-1/2 pound density, with R-value of 4.2 minimum.
 - c. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
 - d. Where installed exposed in the conditioned space, duct shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value – R-4.2).

- e. Cement duct liner in place with nonflammable, non-hardening duct adhesive. Seal all raw edges of insulation inside ductwork with adhesive, including longitudinal liner edges.
- f. Provide metal nosing at all locations where liner is preceded by unlined metal.
- g. Provide sheet metal weld pins and washers or clinch pins and washers on all ductwork on 12 inch intervals with the first row within 3 inches of the leading edge of each piece of insulation and within 4 inches of corners. No use of adhesive mounted pins will be considered.
 - 1) Install clinched pin fasteners with properly adjusted automatic fastening equipment. Manual installation will not be considered.
 - 2) Install weld pins with properly adjusted automatic fastening equipment. Installation shall not damage the galvanized coating on the outside of the duct.
- h. All ductwork, adhesives, lining, sealant, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with one of the following test methods: NFPA 255, ASTM E84, or UL 723.
- i. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

<u>Manufacturer:</u>	<u>Product:</u>
Johns Manville	Linacoustic RC
CertainTeed Corporation	ToughGard
Fosters Adhesive	85-62
Swifts Adhesive	7336

I. Round and Oval Ductwork Fabrication:

- 1. Round and oval duct and fittings shall be spiral lockseam or longitudinal seam as indicated in table below. Provide couplings to join each length of duct.
 - a. At contractors' option, round or oval ductwork may be utilized in place of rectangular ductwork shown on Drawings, provided available space allows installation of round or oval ductwork without compromising space required for installation of products and systems of other trades.
 - 1) Round or oval ductwork utilized in place of rectangular ductwork shown on Drawings shall be sized to have a static pressure loss equivalent to rectangular duct shown on Drawings.
 - 2) Unlined round or oval duct shall not be utilized in place of rectangular internally lined ductwork shown on Drawings.

2. Fabricate duct fittings to match adjoining ducts and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1.5 times associated duct width. Provide two-piece, die-stamped, 45-degree to 90-degree elbows for sizes up to 12 inches; five-piece, 90-degree elbows for sizes 12 inches and above; conical tees; and conical laterals. All reducers shall be placed after a tap has been made on the duct main. Reducers shall be long-taper style.
3. Round Ductwork: Construct of galvanized sheet steel complying with ANSI/ASTM A 653 by the following methods and in minimum gauges listed.

<u>Diameter</u>	<u>Minimum Gauge</u>	<u>Method of Manufacture</u>
Up to 14"	26	Spiral Lockseam
15" to 23"	24	Spiral Lockseam
24" to 36"	22	Spiral Lockseam
37" to 50"	20	Spiral Lockseam
51" to 60"	18	Spiral Lockseam
Over 60"	14	Longitudinal Seam

4. Provide locked seams for spiral duct; fusion welded butt seam for longitudinal seam duct.
5. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous welds along seams at exposed ducts. Provide spot weld bonded seams at concealed ducts.

<u>Diameter</u>	<u>Minimum Gauge</u>
3" to 36"	20
38" to 50"	18
Over 50"	16

6. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
7. Provide 20 gauge minimum for ductwork exposed within occupied spaces.
- J. Round Internally Insulated Duct and Fittings: Where ductwork is exposed to weather or outside the building insulation envelope, construct with outer pressure shell, 2 inch thick (Minimum R-value = R-8) insulation layer, and perforated inner liner. Where ductwork is within the building insulation

envelope, construct with outer pressure shell, 1 inch thick (minimum R-value = R4.2) insulation layer, and perforated inner liner. Construct shell and liner of galvanized sheet steel complying with ANSI/ASTM A 653, of spiral lockseam construction (use longitudinal seam for over 59 inches), in minimum gauges listed in table below. Where installed exposed in the conditioned space: duct and fitting outer pressure shell shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value = R-4.2), and perforated inner liner.

<u>Nominal Duct Diameter</u>	<u>Outer Shell</u>	<u>Inner Liner</u>
3" TO 12"	26 gauge	24 gauge
13" TO 24"	24 gauge	24 gauge
25" to 34"	22 gauge	24 gauge

1. Fittings and Couplings: Construct of minimum gauges listed. Provide continuous weld along seams of outer shell at exposed ducts. Provide spot weld bonded seams at concealed ducts.

<u>Nominal Duct Diameter</u>	<u>Outer Shell</u>	<u>Inner Liner</u>
3" to 34"	20 gauge	24 gauge
36" to 48"	18 gauge	24 gauge

2. Inner Liner: Perforate with 3/32 inch holes for 22 percent open area. Provide metal spacers welded in position to maintain spacing and concentricity.
3. Ducts exposed in the conditioned space shall be free of dents and blemishes and be mounted tight against adjacent surface with flat hangers. Remove all fabrication labels from ductwork.
4. Where installed exposed in the conditioned space, duct shall be minimum 20 gauge with 1 inch insulation layer (minimum R-value – R-4.2).
5. All ductwork, adhesives, lining, sealant, flex duct and the like shall have a flame spread of 25 or less and developed smoke rating of 50 or less when tested in accordance with one of the following test methods: NFPA 255, ASTM E84, or UL 723.
6. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Sheet Metal Div., McGill AirFlow, LLC., Acousti-k27
 - b. Semco Duct and Acoustical Products, Inc.
 - c. Air Systems Manufacturing, Inc. - Las Vegas

K. Duct Access Doors:

1. Duct Access: Provide hinged access door in rectangular ducts for access to fire dampers, control equipment, etc. Access door size shall be duct diameter wide by duct diameter high

for all ducts under 24 inches. Ducts over 24 inches in diameter shall have 24-inch by 18-inch access doors. Minimum size access doors shall be 6 inches by 6 inches.

2. Provide hinged style access doors for round ductwork, NCA Manufacturing, Inc., Model AD-RD-87, Pottorff Series 60, or equal. Access doors shall be 16 gauge galvanized steel with continuous piano hinge. Locks shall be plated steel strike and catch. Provide 1" x 3/8" Polyethylene "Perma Stik" gasket all around door.

L. Flexible Air Ducts:

1. Provide exterior reinforced laminated vapor barrier, fiberglass insulation, encapsulated spring steel wire Helix, and impervious, smooth, non-perforated interior vinyl liner. Individual lengths of flexible ducts shall contain factory fabricated steel connection collars.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) C.A. Schroeder, Inc., Cal Flex model 2PMJ.
 - 2) ThermaFlex model M KC.
2. Factory made air ducts shall be approved for the use intended and shall conform to the requirements of UL 181 and NFPA 90A. Each portion of a factory-made air duct system shall be identified by the manufacturer with a label or other suitable identification indicating compliance with UL 181, Class 1. Ducts shall be UL listed Class 1, maximum 25/50 smoke and flame spread and shall be installed in accordance with the terms of their listing and the requirements of SMACNA HVAC Duct Construction Standards (Metal and Flexible). Factory-made air ducts shall have the following minimum R-values: R-6.0 for ductwork installed within the building insulation envelope, R-8.0 for ductwork installed outside the building insulation envelope.
3. Flexible ductwork shall be maximum of 5 feet long, and shall be extended to the fullest possible length, in order to minimize pressure drop in the duct.
4. Flexible ducts shall be selected for minimum of 6 inch positive static pressure and minimum of 1 inch negative static pressure.

M. Flexible Connectors:

1. Materials: Flame-retardant or noncombustible fabrics. Coatings and adhesives shall comply with UL 181, Class 1, with flame spread index of 25 or less, and smoke-developed index of 50 or less.
2. Metal-Edged Connectors: Factory fabricated with a fabric strip 3 inches wide attached to two strips of 3-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
3. Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - a. Minimum Weight: 26 oz./sq. yd.
 - b. Tensile Strength: Minimum 475 lbf/inch in the warp and minimum 375 lbf/inch in the filling.
 - c. Service Temperature: Minus 50 to plus 200 deg F.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Ductmate Industries, Inc., model Proflex.

- b. Ventfabrics, Inc., model Ventlon.

2.7 PIPE JOINING MATERIALS

- A. Refer to Division 22 and 23 piping sections for special joining materials not listed below.
- B. Brazing Filler Metals:
 - 1. General Duty: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
 - 2. Refrigerant Piping:
 - a. Joining copper to copper: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
 - b. Joining copper to bronze or steel: AWS A5.8, Bag-1, silver alloy unless otherwise indicated.

2.8 INSULATION MATERIALS

- A. General:
 - 1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
 - 2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
 - 3. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
 - 4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
 - 5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
 - 6. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.
 - 7. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
- B. Insulation Materials:
 - 1. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) Aeroflex USA, Inc.
 - 2) Armacell LLC.
 - 3) K-Flex USA.
 - 2. Mineral-Fiber, Preformed Pipe Insulation:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) Johns Manville; a Berkshire Hathaway company.

- 2) Knauf Insulation.
 - 3) Manson Insulation Inc.
 - 4) Owens Corning.
 - b. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL.
3. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Provide 2-inch wide stapling and taping flange.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) CertainTeed Corporation.
 - 2) Johns Manville.
 - 3) Knauf Insulation.
 - 4) Owens Corning.
- C. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Design Polymeric.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Knauf Insulation.
 2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 3. Service Temperature Range: 0 to plus 180 deg F.
 4. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Design Polymeric.
 - b. Childers Brand; H. B. Fuller Construction Products.
 - c. Foster Brand; H. B. Fuller Construction Products.
 2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 3. Service Temperature Range: Minus 50 to plus 220 deg F.
 4. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - a. Design Polymeric.
 - b. Childers Brand; H. B. Fuller Construction Products.
 - c. Foster Brand; H. B. Fuller Construction Products.
 - d. Knauf Insulation.
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: 0 to plus 180 deg F.
 4. Color: White.

F. Field Applied Jackets:

1. PVC Jacket and Factory Fabricated Fitting Covers: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) Johns Manville, model Zeston, with Zeston 2000 fitting covers.
 - 2) Proto Corporation, model LoSmoke.
2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 - 1) Childers Brand; H. B. Fuller Construction Products.
 - 2) ITW Insulation Systems; Illinois Tool Works, Inc.
 - 3) RPR Products, Inc.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Outdoor Applications: 2.5-mil- thick polysurlyn.
 - d. Factory-Fabricated Fitting Covers:
 - 1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 2) Tee covers.
 - 3) Flange and union covers.
 - 4) End caps.
 - 5) Beveled collars.
 - 6) Valve covers.
 - 7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 THERMAL HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
 1. Buckaroos, Inc.
 2. Carpenter & Paterson, Inc.
 3. Clement Support Services.
 4. Rilco Manufacturing Co., Inc.
- B. Flame-spread index of 25 or less and smoke-developed index of 50 or less as tested by ASTM E 84.
- C. Insulation-Insert Material for Cold or Hot Piping, from Minus 40 to Plus 275 Deg F: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength or ASTM C 1126, Type III rigid phenolic foam and vapor barrier.
 1. Phenolic:
 - a. NPS 10 and Smaller: 3.75-lb/cu. Ft. minimum compressive strength.
 - b. NPS 12 to NPS 30: 5.0-lb/cu. ft. minimum compressive strength.

- D. Insulation-Insert Material for Piping Above 275 Deg F: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.
- E. Insulation Protection Shields: Galvanized metal, G90 coating designation, complying with ASTM A 653/A 653M, 180-degree saddle.
- F. Heavy Duty Insulation Protection Shields: Galvanized metal, 12-gage, G90 coating designation, complying with ASTM A 653/A 653M, 180-degree saddle. Structural steel plate welded to bottom of galvanized shield for sizes NPS 6 and larger.
- G. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- H. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- I. Insert Length: Extend minimum 1-1/2 inches beyond sheet metal shield.

PART 3 - **EXECUTION**

3.1 ROOF MOUNTED EQUIPMENT INSTALLATION

3.2 FAN INSTALLATION

- A. Provide access doors for fans or motors mounted in ductwork.
- B. Mount all fans as detailed on Drawings and in compliance with CBC standards.
- C. Fan motors mounted in air-stream to be totally enclosed.
- D. Completely line supply, return or exhaust fan cabinets with 1 inch thick, 3/4 pound density acoustic insulation securely cemented in place.
- E. Roof fans shall be mounted level.
- F. Provide heavy-duty rubber gasket between exhaust fan mounting flange and roof curb, or as required for an airtight installation.

3.3 AIR INLETS AND OUTLETS INSTALLATION

- A. Provide all air inlets and outlets with gaskets and install so that there will be no streaking of the walls or ceilings due to leakage. Duct connection to outlet on exposed duct shall be full size of outer perimeter of outlet flange.
- B. Unless otherwise indicated on Drawings, provide rectangular galvanized steel plenum on top of each diffuser and ceiling return for connection to ductwork. Line plenum with internal insulation as indicated for lined ductwork. Size plenum to allow full opening into air terminal. Plenum sheet metal gauge shall be equal to gauge for rectangular equivalent of the branch duct serving the air inlet or outlet.
- C. Ceiling-mounted air inlets, outlets, or other services installed in T-Bar type ceiling systems shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.

1. Air inlets, outlets, or other services weighing not more than 56 pounds shall have two No. 12 gauge hangers connected from the terminal or service to the structure above. These wires may be slack.
 2. Support air inlets, outlets, or other services weighing more than 56 pounds directly from the structure above by approved hangers. Provide 4 taut 12 gauge wires each, attached to the fixture and to the structure above. The 4 taut 12 gauge wires, including their attachment to the structure above must be capable of supporting 4 times the weight of the unit.
 3. Secure air inlets and outlets to main runners of ceiling suspension system with two No. 8 sheet metal screws at opposing corners.
- D. Furnish all air inlets and outlets with a baked prime coat unless otherwise noted. Provide off-white baked enamel finish on ceiling-mounted air inlets and outlets. Paint exposed mounting screws to match the material being secured.
- E. Air inlets and outlets shall match all qualities of these specified including appearance, throw, noise level, adjustability, etc.

3.4 DAMPER INSTALLATION

- A. All dampers automatically controlled by damper motors are specified under "Temperature Control System" except those specified with items of equipment.
- B. Provide opposed blade manual air dampers at each branch duct connection and at locations indicated on the drawings and where necessary to control air flow for balancing system. Provide an opposed blade balancing damper in each zone supply duct. Provide an access panel or Ventlok flush type damper regulator on ceiling or wall for each concealed damper.
- C. Provide 18 inch x 12 inch minimum hinged access doors in ductwork and furring for easy access to each fire damper; insulated access doors in insulated ducts. Label access doors with 1/2 inch high red letters.
1. Provide Ventlok Series 100, Durodyne, or equal access doors with hardware for convenient access to all automatic dampers and other components of the system, insulated type in insulated ducts. Provide Ventlok #202 for light duty up to 2 inch thick doors, #260 heavy-duty up to 2 inch thick doors and #310 heavy-duty for greater than 2 inch thick doors. Provide #260 hinges on all hinged and personnel access doors; include gasketing.

3.5 DUCTWORK INSTALLATION

- A. General:
1. Assemble and install ductwork in accordance with recognized industry practices which will achieve air tight and noiseless (no objectionable noise) systems capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections within 1/8 inch misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers, and anchors of type which will hold ducts true to shape and to prevent buckling. Where possible, install ductwork to clear construction by 1/4 inch minimum, except at air inlets and outlets. Where ductwork will not clear construction, secure duct firmly to eliminate noise in the system.

2. Duct Joints: Install duct sealers, pop rivets or sheet metal screws at each fitting and joint. Duct sealers shall be fire retardant. Sheet metal screws for joints shall be minimum #10 size galvanized.
 3. Where ductwork is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
 4. Horizontal runs of ductwork suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
 5. Provide sheet metal angle frame at all duct penetrations to wall, floor, roof, or ceiling.
 6. Paint inside of ducts, visible through grille, dull black.
 7. Where ductwork is installed in finished areas of buildings that do not have ceilings, paint ductwork, support hangers, and air inlets and outlets to match adjacent architectural surfaces, or as directed by Architect.
 8. At the time of rough installation, or during storage on the construction site and until final startup of the heating and cooling equipment, duct and other related air distribution component openings shall be covered with tape, plastic, sheet metal, or other methods acceptable to the enforcing agency.
- B. Firestopping:
1. Pack the annular space between duct openings and ducts penetrating floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
 - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
 2. Firestopping systems to be installed in strict accordance with manufacturer's instructions.
 3. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.
- C. Flashing:
1. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
 2. Refer to Division 07 specifications and Drawings details as applicable.
 3. Flashing for penetrations of roof for mechanical items such as flues and ducts shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
 - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
 - b. Flues and ducts shall have 24 gauge galvanized sheet metal storm collar securely clamped to the flue above the flashing.

- D. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw
For ducts with P/2 over 73"	3/8"x 1-1/2" lag screw

- E. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger
For duct with P/2 larger than 120"	NOT ALLOWED

- F. Upper connection to manufactured truss construction must comply with truss manufacturers published requirements and Structural Engineers requirements.
- G. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct plus insulation with sheet metal flanges of same gauge as duct. Overlap opening on four sides by at least 1-1/2 inches.
- H. Support ductwork in manner complying with SMACNA "HVAC Duct Construction Standards," hangers and supports sections. Where special hanging of ductwork is detailed or shown on Drawings, Drawings shall be followed. Angles shall be attached to overhead construction in a manner so as to allow a minimum of 2 inches of movement in all directions with no bending or sagging of the angle.
1. Except where modified in individual paragraphs of this Section, provide hanger support with minimum 18 gauge straps, 1 inch wide. Fold duct strap over at bottom of duct.
 2. Install duct supports to rectangular ducts with sheet metal screws. Provide one screw at top of duct and one screw into strap at bottom of duct.
- I. Installation of Flexible Ductwork:
1. Provide flexible ducts with supports at 30 inch centers with 2 inch wide, 26 gauge steel hanger collar attached to the structure with an approved duct hanger. Installation shall minimize sharp radius turns or offsets.
 - a. Supports shall be in accordance with SMACNA HVAC Duct Construction Standards (Metal and Flexible).
 - b. Flexible duct bends shall be not less than 1-1/2 duct diameter bend radius.
 2. Make connections to rigid duct and units with Panduit style draw band at inner liner material, and a second draw band over the outer vapor barrier material.

3. Make connection to duct with spin-in fittings, with air scoop and balance damper.

3.6 DUCTWORK SEALING AND LEAK TESTING

- A. All ductwork shall receive a Class A seal.
- B. Seal airtight all joints and seams, including standing seams and manufactured joints and seams, of all supply, return and exhaust ducts except those exposed in conditioned space.
- C. Leakage Classes:

<u>Pressure Class</u>	<u>Leakage Class</u>	
	<u>Round Duct</u>	<u>Rectangular Duct</u>
2"W.G. or less	8	16
4"W.G. or greater	2	4

- D. All duct systems (supply, return, outside air intake, and exhaust), except those identified on compliance forms on Drawings as requiring Acceptance Testing per the requirements of the California Energy Code, shall be tested in accordance with the requirements of SMACNA "HVAC Air Duct Leakage Test Manual." Test pressure shall be equal to the pressure class of the duct. For additional duct leak testing requirements, refer to Section 23 08 00.13, "Title 24 Commissioning of HVAC."

3.7 PIPING INSTALLATION

- A. General:
 1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
 2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
 3. Install piping to permit application of insulation and to allow valve servicing.
 4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
 5. Horizontal runs of pipes and conduits suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
 6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.
 7. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
 8. Verify final equipment and fixture locations for roughing-in.
 9. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.

10. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
 11. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
 12. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
 13. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
- B. Sleeves:
1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
 2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.
- C. Floor, Wall, and Ceiling Plates:
1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.
- D. Firestopping:
1. Pack the annular space between pipe sleeves and pipes penetrating floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
 - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
 2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with CBC requirements.
 3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
 4. Copper and steel piping shall have SpecSeal, or equal, plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
 5. Firestopping systems to be installed in strict accordance with manufacturer's instructions.
 6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.
- E. Flashing:

1. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
2. Refer to Division 07 specifications and Drawings details as applicable.
3. Flashing for penetrations of metal or membrane roof for pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type.
 - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
 - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Elmdor/Stoneman Model 1540.
4. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.

3.8 PIPE JOINTS AND CONNECTIONS

A. General:

1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.

B. Copper Pipe and Tubing: All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except pneumatic control piping, and hydronic piping having grooved-end fittings and couplings.

C. Flexible Connections:

1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, except fan coil units under 2000 cfm, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
2. Flexible connections in refrigerant lines; Flexonic, Anaconda or equal, metal hose, full size.
3. Anchor piping securely on the system side of each flexible connection.

3.9 HANGER AND SUPPORT INSTALLATION

A. General: Support ductwork, equipment and piping so that it is firmly held in place by approved iron hangers and supports, and special hangers. Hanger and support components shall support weight of ductwork, equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Where building structural members do not match piping and ductwork support spacing, provide "bridging" support members firmly attached to building structural members in a fashion approved by the structural engineer.

1. Materials, design, and type numbers for support of piping per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
 - a. Provide copper-plated or felt-lined hangers for use on uninsulated copper tubing.

2. Materials and design for ductwork support shall be per SMACNA "HVAC Duct Construction Standards, Metal and Flexible."
- B. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
- C. Riser clamps: B-line model B3373, or equal.
- D. Rubber Neoprene Pipe Isolators:
 1. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
 2. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
 3. Manufacturers:
 - a. Vertical runs: Acousto-Plumb or equal.
 - b. Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.
- E. Duct Hanger and Support Spacing: Conform to Requirements of CMC and SMACNA "HVAC Duct Construction Standards, Metal and Flexible."
- F. Duct Support to Structure:
 1. Upper connection of support to wood structure shall be with wood screws or lag screws in shear fastened in the upper one half of the wood structural member. Fasteners shall conform to the following schedule:

For ducts with P/2=30"	#10 x 1-1/2" wood screw
For ducts with P/2=72"	1/4"x 1-1/2" lag screw
For ducts with P/2 over 73"	3/8"x 1-1/2" lag screw

2. Upper connection in tension to wood shall not be used unless absolutely necessary. Where deemed necessary the contractor shall submit calculations to show the size fastener and penetration required to support loads in tension from wood in accordance with the following schedule:

For ducts with P/2=30"	260 pounds per hanger
For ducts with P/2=72"	320 pounds per hanger
For ducts with P/2=96"	460 pounds per hanger
For duct with P/2 larger than 120"	NOT ALLOWED

3. Install concrete inserts for support of ductwork in coordination with formwork as required to avoid delays in work.

4. Upper connection to manufactured truss construction must comply with truss manufacturers published requirements and Structural Engineers requirements.

G. Duct Insulation Installation:

1. General:
 - a. Insulation applied to the exterior surface of ducts located in buildings shall have a flame spread of not more than 25 and a smoke-developed rating of not more than 50 when tested as a composite installation including insulation, facing materials, tapes and adhesives as normally applied. Material exposed within ducts or plenum shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 50.
 - b. Duct insulation applied to the exterior surface of ducts installed outside the building insulation envelope shall meet minimum R-value of R-8 at 3 inches thickness and 3/4 pound per cubic foot density.
 - c. Duct insulation applied to the exterior surface of ducts installed within the building insulation envelope shall meet minimum R-value of R-4.2 at 1-1/2 inches thickness and 3/4 pound per cubic foot density.
2. Mineral Fiber Blanket Installation:
 - a. Insulate all unlined concealed supply and return ducts with fiberglass duct wrap, manufactured as a blanket of glass fibers factory laminated to a reinforced foil/kraft vapor retarding facing. Provide 2 inch stapling and taping flange. Wrap insulation entirely around duct and secure with outward clinching staples on 6 inch centers. Provide mechanical fasteners at maximum 18 inch centers for all bottoms of duct which are greater than 24 inches. Lap all insulation joints 3" minimum. Insulate ducts installed tight against other work before hanging in place. Seal all seams, both longitudinal and transverse, and all staple and mechanical fastener penetrations of facing with scrim backed foil tape or recommended sealant, to provide a vapor tight installation.
3. PVC Jacket Installation:
 - a. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
 - 1) Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.10 TESTING AND BALANCING

- A. For testing and balancing requirements, refer to Section 23 05 93, Testing and Balancing for HVAC.

3.11 CLEANING AND PROTECTION

- A. As each duct section is installed, clean interior of ductwork of dust and debris. Clean external surfaces of foreign substances that might cause corrosive deterioration of metal or where ductwork is to be painted.
- B. Strip protective paper from stainless steel ductwork surfaces, and repair finish wherever it has been damaged.

- C. Temporary Closure: At ends of ducts that are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering that will prevent entrance of dust and debris until connections are to be completed.
- D. As each internally lined duct section is installed, check internal lining for small cuts, tears, or abrasions. Repair all damage with fire retardant adhesive.

3.12 EQUIPMENT MOUNTING

- A. Mount and anchor equipment in strict compliance with Drawings details. Alternate anchorage methods will not be considered for roof mounted equipment.

3.13 INDOOR PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping, Cooling-Only Systems:
 - 1. Suction and hot-gas piping smaller than 1-1/2 inches diameter:
 - a. Flexible Elastomeric: 1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe: 1/2 inch thick.
 - 2. Suction piping 1-1/2 inches diameter and larger:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe: 1 inch thick.
- B. Refrigerant Vapor and Liquid Piping, Heat Pump Systems:
 - 1. Vapor piping for heat pump applications smaller than 1-1/2 inches diameter:
 - a. Flexible Elastomeric: 1-1/2 inches thick.
 - b. Mineral-Fiber, Preformed Pipe: 1-1/2 inches thick.
 - 2. Vapor piping for heat pump applications 1-1/2 inches diameter and larger:
 - a. Flexible Elastomeric: 2 inches thick.
 - b. Mineral-Fiber, Preformed Pipe: 2 inches thick.
 - 3. Liquid piping for heat pump applications smaller than 1 inch diameter:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe: 1 inch thick.
 - 4. Liquid piping for heat pump applications 1 inch diameter and larger:
 - a. Flexible Elastomeric: 1-1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe: 1-1/2 inch thick.

END OF SECTION 23 80 00

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section covers general work of all Sections under Division 26.
- B. Provide a complete working electrical installation with all equipment called for in proper operating condition. Documents do not undertake to show or list every item to be provided. When an item not shown or listed is clearly necessary for proper operation of equipment which is shown or listed, provide the item which will allow the system to function properly at no increase in Contract Price.

1.2 REFERENCES

- A. The General Conditions, Supplementary Conditions, and applicable portions of Divisions 01 and 26 apply to the work of this Section as if printed herein.

1.3 SUBMITTALS

- A. Forward all submittals in related groups. Individual or incomplete submittals are not acceptable.
- B. Identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and check materials and equipment.
- C. Identify each submittal item by reference to Specification Section paragraph in which item is specified or Drawing and Detail number.
- D. Organize submittals in same sequence as they appear in Specification Sections, articles or paragraphs.
- E. Shop Drawings shall show physical arrangement, construction details and finishes.
 - 1. Drawings shall be drawn to scale and dimensioned where applicable.
 - 2. Catalog cuts and published material may be included to supplement scale drawings.
- F. Internal wiring diagrams of equipment shall show wiring as actually furnished for this project with all optional items clearly identified as included or excluded. Clearly identify external wiring connections. Identify and obliterate superfluous material.
- G. Binders: Prepare submittal material in accordance with the following:
 - 1. Insert all literature in standard 3-ring binders for 8-1/2 inch by 11 inch pages with individual tabs. Do not staple literature on different products together.
 - 2. Number all binders on the outside of the cover and indicate the Specification Section. Mark Binder No. 1 Architect's copy and No. 2 Engineer's copy. Both of these binders shall contain original manufacturer's literature.
 - 3. Provide an index with binder. This index shall follow the same sequence as the Specifications.
- H. Submittal literature, drawings and wiring diagrams shall be specifically applicable to this Project and shall not contain extraneous material or optional choices. Clearly mark literature to indicate the proposed item. Submittals shall include, but not be limited to those items listed in individual Sections.
 - 1. Include all physical and performance data, including materials, manufacturer's names, model numbers, weights, sizes, capacities, performance curves, finishes, colors, accessories and all other data required to completely describe equipment and to indicate complete compliance with Specifications and Drawings.
 - 2. Include with complete submittals above, complete, large scale, dimensioned Shop Drawings, certified by manufacturer, of all major equipment and other equipment as directed by Architect.

- I. Resubmittals will be reviewed for compliance with comment made on the original submittal only and should be marked with a resubmittal number and dated.
- J. Operating & Maintenance Instructions and Manuals:
 - 1. Subsequent to final completions and testing operations, this Division is responsible for instructing the Owner's authorized representatives in operation, adjustment and maintenance of electrical plant.
 - 2. Submit three (3) copies of certificate, signed by Owner's Representatives, attesting to their having been instructed.
 - 3. Before Owner's personnel assume operation of systems, submit three (3) sets of operating maintenance manuals. Bind data in vinyl covered loose-leaf binders with title index tabs identifying items therein to include:
 - a. Fire Alarm and Smoke Detection System
 - b. Miscellaneous Signal Systems.
 - 4. Provide two (2) full size prints of Record Drawing One-Line Diagram, in metal frame with glass front. Obtain record drawing prints from Architect at Contractor's cost and have prints framed in location as directed.
- K. Submit as-built drawings showing actual constructed conditions, in accordance with the provisions of Section 01 77 00.

1.4 QUALITY ASSURANCE

- A. Materials and Systems:
 - 1. Labels: Provide materials listed and labeled by Underwriters' Laboratories or testing firm acceptable to authority having jurisdiction, where listing service is normally provided for product.
 - 2. Materials: Provide new and ship to jobsite in original manufacturer's containers or bundles.
- B. Workmanship: Arrange work to obtain coordinated installation.
- C. Code Compliance: Comply with applicable codes, laws, rules, regulations, and standards of applicable code-enforcing authorities.
- D. References and Standards: All materials and equipment shall comply with all applicable standards and requirements of the standards listed below. Nothing in the Drawings or Specifications shall be construed to permit Work not conforming to applicable laws, ordinances, rules and regulations. It is not the intent of Drawings or Specifications to repeat requirements of codes except where necessary for completeness or clarity.
 - 1. American National Standards Institute (ANSI).
 - 2. Association of Edison Illuminating Companies (AEIC).
 - 3. Insulated Cable Engineers Association (ICEA).
 - 4. Institute of Electrical and Electronics Engineers (IEEE).
 - 5. National Electrical Manufacturer's Association (NEMA).
 - 6. Underwriters' Laboratories, Inc. (UL).
 - 7. 2019 California Building Code, Part 2, Title 24 (2018 IBC and 2019 California Amendments).
 - 8. 2019 California Electrical Code, Part 3, Title 24 (2017 NEC and 2019 California Amendments).
 - 9. 2019 California Mechanical Code, Part 4, Title 24 (2018 UMC and 2019 California Amendments).
 - 10. 2019 California Plumbing Code, Part 5, Title 24, CCR (2018 UPC and 2019 California Amendments).
 - 11. 2019 California Fire Code, Part 9, Title 24 (2018 IFC and 2019 California Amendments).
 - 12. 2019 California Referenced Standards Code Part 12, Title 24.
 - 13. State of California Low-Voltage Electrical Safety Orders (CAL/OSHA).

14. State of California High-Voltage Electrical Safety Orders (CAL/OSHA).
- E. Codes and regulations noted in other Sections in Division 26, applicable State and Local Codes and Ordinances. If any of the requirements of the above are in conflict with one another, or with the requirements of these specifications, the most stringent requirement shall govern.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect from loss or damage. Replace lost or damaged materials and equipment with new at no increase in Contract Sum.

1.6 DRAWINGS AND COORDINATION WITH OTHER WORK

A. Drawings:

1. For purposes of clarity, legibility, Drawings are essentially diagrammatic.
2. Exact routing of wiring and locations of outlets, panels, etc., shall be governed by structural conditions, obstructions and existing conditions. Architect reserves right, at no increase in price, to make any reasonable change in locations of electrical items, exposed at ceiling and/or on walls, to group them into orderly relationships and/or increase their utility. Contractor shall verify Architect's requirements in this regard prior to roughing-in.
3. Dimensions, location of doors, partitions, and similar physical features shall be taken from Architectural Drawings for exact location of outlets to center with Architectural features, panels, etc., at the approximate location shown on Electrical Drawings.
4. Mounting heights of brackets, outlets, etc., shall be as required to suit equipment served.
5. Drawings indicate, generally, routes of all branch circuits. All runs to panels are indicated as starting from nearest outlet, pointing in direction of panel. Continue all such circuits to panel as though routes were indicated in their entirety.

B. Coordination:

1. Work out all "tight" conditions involving Work under this Division and Work in other Divisions in advance of installation. If necessary, and before Work proceeds in these areas, prepare supplementary Drawings under this Division for review, showing all Work in "tight" area. Provide supplementary Drawings and additional Work necessary to overcome "tight" conditions.
2. Differences or disputes concerning coordination, interference or extent of Work between Divisions shall be decided by Contractor. His decision, if consistent with Contract Documents requirements, shall be final.
3. Coordinate electrical power and control wiring requirements of mechanical equipment with Division 23.
4. Where conflict exists between rough-in shown on drawings and that shown or required by equipment to be installed, obtain clarification from Architect and provide rough-in as directed.
5. Provide templates, information and instructions to other Divisions to properly locate holes and openings to be cut or provided for Electrical Work.
6. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.
7. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment that requires positioning before closing in the building.
8. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.
9. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

- C. Large Scale Layout Drawings: In accordance with requirements of Section 01 77 00, prepare large scale detailed layout Drawings showing locations of equipment, conduit runs, panels, and all other elements of electrical systems where required by other Sections of this Division, plus sections of all congested areas to show relative position and spacing of affected elements. All symbols and designations used in preparing record Drawings shall match those used in Contract Drawings.
- D. Equipment Rough-In:
 - 1. Rough-in locations shown on Electrical Drawings for equipment furnished by Owner and for equipment furnished under other Divisions are approximate only.
 - a. Obtain exact rough-in locations from following sources:
 - 1) From shop drawings for Contractor-furnished and installed equipment.
 - 2) From Architect for Owner-furnished Contractor-installed equipment.
 - 2. Verify electrical characteristics of equipment before starting rough-in. Where conflict exists between equipment and rough-in shown on Drawings obtain clarification from Architect and provide as directed.
 - 3. Unless otherwise shown or specified, provide direct raceway and conductor connections from building wiring system to equipment terminals for direct connected equipment which is Contractor furnished and Contractor installed, Owner furnished and Contractor installed.
 - 4. Provide plug-in receptacle cap for cord connected equipment which is Contractor furnished and Contractor installed, Owner furnished and Contractor installed. Provide new cord and cap if required on Owner furnished and Contractor installed equipment.
 - 5. Provide disconnect switches, flush type in finished spaces, where shown or required by code for direct connected equipment.

PART 2 - **PRODUCTS**

2.1 MATERIALS FURNISHED

- A. New, bearing label of Underwriter's Laboratories, or other testing laboratory acceptable to authority having jurisdiction, where labeling exists for the class of equipment.
- B. Provide equipment of one manufacturer, alike in appearance and function.
- C. For equipment specified by manufacturer's number, include all accessories, controls, etc., listed in catalogue as standard with equipment. Furnish optional or additional accessories as specified.
- D. Where no specific make of material or equipment is mentioned, use any product of reputable manufacturer which conforms to requirements of system and other applicable specification sections.
- E. Equipment and material damaged during transportation, installation, or operation is considered as totally damaged. Replace with new. Variance from this permitted only with written approval.
- F. Provide an authorized representative to constantly supervise Work of this Division, check all materials prior to installation for conformance with Drawings, Specifications, and reviewed Shop Drawings.

2.2 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs. Strength rating to suit structural loading.
- D. Slotted Channel Fittings and Accessories: Recommended by the manufacturer for use with the type and size of channel with which used.
- E. Materials: Same as channels and angles, except metal items may be stainless steel.

- F. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- H. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- I. Expansion Anchors: Carbon-steel wedge or sleeve type.
- J. Toggle Bolts: All-steel springhead type.
- K. Powder-Driven Threaded Studs: Heat-treated steel.

2.3 ELECTRICAL IDENTIFICATION

- A. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1-inch wide by 3 mils thick.
- B. Tape Markers for Conductors: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- C. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick.
 - 2. Embedded continuous metallic strip or core.
 - 3. Printed legend that indicates type of underground line.
- E. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.
- F. Warning and Caution Signs: Preprinted; comply with 29 CFR 1910.145, Chapter XVII. Colors, legend, and size appropriate to each application.
 - 1. Interior Units: Aluminum, baked-enamel-finish, punched or drilled for mechanical fasteners.
 - 2. Exterior Units: Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate with 0.0396-inch, galvanized-steel backing. 1/4-inch grommets in corners for mounting.
- G. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.
- H. Electrical Outlets: Dymo labels, self-adhesive.

2.4 CONCRETE BASES

- A. Concrete Forms and Reinforcement Materials: As specified in Section 03 30 00 "Cast-in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Manufacturer's Directions: Follow in all cases where manufacturers of articles used furnish directions covering points not specified or shown.
- B. Equipment: Accurately set and leveled with supports neatly placed and properly fastened as shown and specified. Provide means of bringing in and installing equipment into position inside building.

Install to facilitate service, maintenance and repair or replacement of components. Connect for ease of disconnecting with minimum interference with other installations.

- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.
- D. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- E. Right of Way: Give to raceways and piping systems installed at a required slope.
- F. Conduit Systems:
 - 1. Worked into complete, integrated arrangement with like elements to make Work neat appearing, finished.
 - 2. Run concealed, except as shown or noted otherwise. Where exposed, install parallel with walls or structural elements: vertical runs plumb; horizontal runs level or parallel with structure as appropriate: groups racked together neatly with straight runs and bends both parallel and uniformly spaced.
 - 3. Install as high as practicable to maintain adequate head room shown or required. Coordinate with Work of other Divisions to achieve proper headroom.
 - 4. Flash and counter-flash all conduits through roof in accordance with requirements of Section 07 62 00.
 - 5. Clearance: Do not obstruct spaces required by code in front of electrical equipment, access doors, etc.
- G. Penetrations:
 - 1. Pack space between conduit, sleeve in walls with non-combustible materials.
 - 2. Make penetrations through floors water-tight with non-hardening sealant even though concealed within wall or furred space.
 - 3. Make penetrations through any damp-proofed/water-proofed surfaces damp-proof/waterproof by appropriate means to maintain integrity of system penetrated.
 - 4. Seal around penetrations with fireproofing material to maintain integrity of fire rating where occurs.
- H. Provide shrouds at light fixtures, electrical panelboards and like items to maintain integrity of rated wall or ceiling construction.
- I. Hangers, Supports, Anchors and Chases:
 - 1. Provide complete as required for installation of Electrical Work.
 - 2. Equipment to be of metal only: no wood or combustible material will be permitted including supports for outlet boxes.
 - 3. Hangers, anchors and supports for conduit runs: As specified.
 - 4. Provide concrete insets for attachment of hangers; subject to structural engineer's review.
 - 5. Provide anchors for floor and wall mounted equipment.
 - 6. Provide supports for wall mounted equipment.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, slotted channel system components.
- B. Dry Locations: Steel materials.
- C. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four with, 200-lb minimum design load for each support element.

3.3 SUPPORT INSTALLATION

- A. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- B. Size supports for multiple raceway or cable runs so capacity can be increased by a 25 percent minimum in the future.

- C. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps except use spring-steel fasteners for 1-1/2-inch and smaller single raceways above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- E. Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:
 - 1. Wood: Wood screws or screw-type nails.
 - 2. Gypsum Board: Toggle bolts. Seal around sleeves with joint compound, both sides of wall.
 - 3. Masonry: Toggle bolts on hollow block and expansion bolts on solid block. Seal around sleeves with mortar, both sides of wall.
 - 4. New Concrete: Concrete inserts with machine screws and bolts.
 - 5. Existing Concrete: Expansion bolts.
 - 6. Structural Steel: Spring-tension clamps.
 - a. Comply with AWS D1.1 for field welding.
 - 7. Light Steel Framing: Sheet metal screws.
 - 8. Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.
 - 9. Light Steel: Sheet-metal screws.
 - 10. Fasteners: Select so load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
- F. Install warning, caution, and instruction signs where required to comply with 29 CFR 1910.145, Chapter XVII, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Indoors install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- G. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

3.5 FIRESTOPPING

- A. Apply firestopping to cable and raceway sleeves and other penetrations of fire-rated floor and wall assemblies to restore original undisturbed fire-resistance ratings of assemblies. Firestopping installation is specified in Section 07 84 00 "Penetration Firestopping".

3.6 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated.

3.7 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.8 CUTTING AND PATCHING

- A. Do all cutting, repairing, including structural reinforcing, necessary for Work under this Division. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Do not do any cutting or patching without approval. Repair, refinish and touch up disturbed finish materials and other surfaces to match adjacent undisturbed surfaces equal to original condition in Architect's opinion.

3.9 EXCAVATING & BACKFILLING

- A. Provide as required for installation of work under this Division in accordance with requirements of Section 31 23 16.
- B. Provide all necessary shoring, pumping as part of Work of this Division.
- C. In any asphalt or concrete paved areas, backfill only to sub grade level.

3.10 TESTING AND ADJUSTING

- A. Furnish all labor and test equipment required under this Division.
- B. Test panels and branch circuits for grounds or shorts. Repair defective wiring as required.
- C. Test each individual circuit at panel for proper operation.
- D. Upon completion of Work, make final inspection; operate equipment under normal conditions, to satisfaction of Architect.
- E. At completion of Work, provide written certification that all systems are functioning properly without defects.
- F. Test all feeders for line-to-ground and line-to-line resistance with a 500 VDC motor driven "Megger". Minimum acceptable resistance is 100 meg-ohms. Schedule all feeders and indicate line-to-ground and line-to-line resistances. Have all tests witnessed by Architect or his authorized representative.
- G. Perform testing at a time suitable to the Architect and Owner. Advise the Architect a minimum of two weeks prior to testing so that he can arrange to be present if he desires.
- H. Provide for Grounding System: Test for ground currents with all equipment energized. Include ground impedance test by 2 or 3-point fall-of-potential method.
- I. Submit six (6) sets of test reports for review.

3.11 CLEANING AND PAINTING

- A. Properly prepare Work under this Division to be finish painted under Section 09 90 00.
- B. Refinish Work supplied with final finish under this Division if damaged under this Division to satisfaction of Architect.

3.12 After other Work is accomplished, clean exposed conduit, panels (interiors and exteriors), fixtures, equipment and leave in satisfactory condition.

3.13 VOLTAGE CHECK

- A. At completion of job, check voltage at several points of utilization on the system which has been installed under this Contract. During test, energize all installed loads.
- B. Adjust taps on transformers to give proper voltage, which is 118 to 122 volts for 120-volt nominal systems and proportionately equivalent for higher voltage systems. If proper voltage cannot be obtained, inform the Architect and the Owner.

END OF SECTION 26 05 0

SECTION 26 05 03 - EQUIPMENT WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes electrical connections to equipment.
- B. Related Sections:
 - 1. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cable.
 - 2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA WD 1 - General Requirements for Wiring Devices.
 - 2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. Manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 73 00 and 017700 - Execution and Closeout Procedures.
- B. Section 01 78 39 - Project Record Documents: Record actual locations, sizes, and configurations of equipment connections.

1.5 COORDINATION

- A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 - PRODUCTS

2.1 CORD AND PLUGS

- A. Manufacturers:
 - 1. Leviton.
 - 2. Arrow Hart.
 - 3. Pass & Seymour.
 - 4. Eagle.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
- C. Configuration: NEMA WD 6; match receptacle configuration at outlet furnished for equipment.
- D. Cord Construction: Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 - **EXECUTION**

3.1 EXAMINATION

- A. Verify equipment is ready for electrical connection, for wiring, and to be energized.

3.2 EXISTING WORK

- A. Remove exposed abandoned equipment wiring connections, including abandoned connections above accessible ceiling finishes.
- B. Disconnect abandoned utilization equipment and remove wiring connections. Remove abandoned components when connected raceway is abandoned and removed. Install blank cover for abandoned boxes and enclosures not removed.
- C. Extend existing equipment connections using materials and methods compatible with existing electrical installations.

3.3 INSTALLATION

- A. Make electrical connections.
- B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install receptacle outlet to accommodate connection with attachment plug.
- E. Install cord and cap for field-supplied attachment plug.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

3.4 ADJUSTING

- A. Section 01 73 00 and 017700 - Execution and Closeout Procedures.
- B. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

END OF SECTION 26 05 03

SECTION 26 05 11 - REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section applies to all sections of Division 26.
- B. Furnish and install electrical systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on the drawings.
- C. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.
- D. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

1.2 MINIMUM REQUIREMENTS

- A. The latest California Building Code (CBC), Underwriters Laboratories, Inc. (UL), Institute of Electrical and Electronics Engineers (IEEE), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.
- B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

1.3 TEST STANDARDS

- A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.
- B. Definitions:
 - 1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
 - 2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
 - 3. Certified: Materials and equipment which:
 - a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.

- b. Are periodically inspected by a NRTL.
- c. Bear a label, tag, or other record of certification.
- 4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)

- A. Manufacturer's Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.
- B. Product Qualification:
 - 1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.
 - 2. The District reserves the right to require the Contractor to submit a list of installations where the materials and equipment have been in operation before approval.
- C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.5 APPLICABLE PUBLICATIONS

- A. Applicable publications listed in all Sections of Division 26 shall be the latest issue, unless otherwise noted.
- B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

1.6 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available. Materials and equipment furnished shall be new, and shall have superior quality and freshness.
- B. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
 - 1. Components of an assembled unit need not be products of the same manufacturer.
 - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 - 3. Components shall be compatible with each other and with the total assembly for the intended service.
 - 4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Tests are specified, Factory Tests shall be performed in the factory by the equipment manufacturer. In addition, the following requirements shall be complied with:
 - 1. When factory tests are successful, contractor shall furnish four (4) copies of the equipment manufacturer's certified test reports to EOR fourteen (14) days prior to shipment of the equipment, and not more than ninety (90) days after completion of the factory tests.
 - 2. When factory tests are not successful, factory tests shall be repeated in the factory by the equipment manufacturer. The Contractor shall be liable for all additional expenses for the EOR to witness factory re-testing.

1.7 MATERIALS AND EQUIPMENT PROTECTION

- A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
 - 1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
 - 2. During installation, equipment shall be protected against entry of foreign matter, and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
 - 3. Damaged equipment shall be repaired or replaced, as determined by the IOR.
 - 4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
 - 5. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.8 WORK PERFORMANCE

- A. All electrical work shall comply with requirements of the latest NFPA 70 (NEC and CEC), NFPA 70B, NFPA 70E, NFPA 99, NFPA 110, OSHA Part 1910 subpart J – General Environmental Controls, OSHA Part 1910 subpart K – Medical and First Aid, and OSHA Part 1910 subpart S – Electrical, in addition to other references required by contract.
- B. Job site safety and worker safety is the responsibility of the Contractor.
- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. However, energized electrical work may be performed only for the non-destructive and non-invasive diagnostic testing(s), or when scheduled outage poses an imminent hazard to patient care, safety, or physical security. In such case, all aspects of energized electrical work, such as the availability of appropriate/correct personal protective equipment (PPE) and the use of PPE, shall comply with the latest NFPA 70E, as well as the following requirements:
 - 1. Only Qualified Person(s) shall perform energized electrical work. Supervisor of Qualified Person(s) shall witness the work of its entirety to ensure compliance with safety requirements and approved work plan.
 - 2. At least two weeks before initiating any energized electrical work, the Contractor and the Qualified Person(s) who is designated to perform the work shall visually inspect, verify and confirm that the work area and electrical equipment can safely accommodate the work involved.
 - 3. At least two weeks before initiating any energized electrical work, the Contractor shall develop and submit a job specific work plan, and energized electrical work request to EOR and IOR. At the minimum, the work plan must include relevant information such as proposed work schedule, area of work, description of work, name(s) of Supervisor and Qualified Person(s) performing the work, equipment to be used, procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used, and exit pathways.
 - 4. Energized electrical work shall begin only after the Contractor has obtained written approval of the work plan, and the energized electrical work request from IOR and utility inspector. The Contractor shall make these approved documents present and available at the time and place of energized electrical work.
 - 5. Energized electrical work shall begin only after the Contractor has invited and received acknowledgment from IOR and utility inspector to witness the work.

- D. For work that affects existing electrical systems, arrange, phase and perform work to assure minimal interference with normal functioning of the facility. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.
- E. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.
- F. Coordinate location of equipment and conduit with other trades to minimize interference.

1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working clearances shall not be less than specified in the CEC.
- C. Inaccessible Equipment:
 - 1. Where the Government determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
 - 2. "Readily accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.
- D. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.

1.10 EQUIPMENT IDENTIFICATION

- A. In addition to the requirements of the CEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, generators, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.
- B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 12 mm (1/2 inch) high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.
- C. Install adhesive arc flash warning labels on all equipment as required by the latest NFPA 70E. Label shall show specific and correct information for specific equipment based on its arc flash calculations. Label shall show the followings:
 - 1. Nominal system voltage.
 - 2. Equipment/bus name, date prepared, and manufacturer name and address.
 - 3. Arc flash boundary.
 - 4. Available arc flash incident energy and the corresponding working distance.
 - 5. Minimum arc rating of clothing.
 - 6. Site-specific level of PPE.

1.11 SUBMITTALS

- A. Submit to EOR in accordance with Section 01 33 00, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. The EOR's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.
- C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the EOR to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
 - 1. Mark the submittals per spec section 01 33 00.
 - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
 - 3. Submit each section separately.
- E. The submittals shall include the following:
 - 1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
 - 2. Submittals are required for all equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion, etc.) associated with equipment or piping so that the proposed installation can be properly reviewed. Include sufficient fabrication information so that appropriate mounting and securing provisions may be designed and attached to the equipment.
 - 3. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
 - 4. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.
- F. Maintenance and Operation Manuals:
 - 1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.
 - 2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
 - 3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
 - 4. The manuals shall include:
 - a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
 - b. A control sequence describing start-up, operation, and shutdown.

- c. Description of the function of each principal item of equipment.
 - d. Installation instructions.
 - e. Safety precautions for operation and maintenance.
 - f. Diagrams and illustrations.
 - g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
 - h. Performance data.
 - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
 - j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.
- G. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.
- H. After approval and prior to installation, furnish the //Resident Engineer// //COR// with one sample of each of the following:
- 1. A minimum 300 mm (12 inches) length of each type and size of wire and cable along with the tag from the coils or reels from which the sample was taken. The length of the sample shall be sufficient to show all markings provided by the manufacturer.
 - 2. Each type of conduit coupling, bushing, and termination fitting.
 - 3. Conduit hangers, clamps, and supports.
 - 4. Duct sealing compound.
 - 5. Each type of receptacle, toggle switch, lighting control sensor, outlet box, manual motor starter, device wall plate, engraved nameplate, wire and cable splicing and terminating material, and branch circuit single pole molded case circuit breaker.

1.12 SINGULAR NUMBER

- A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.13 ACCEPTANCE CHECKS AND TESTS

- A. The Contractor shall furnish the instruments, materials, and labor for tests.
- B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all components between various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the District.
- C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests for the equipment. Repair, replacement, and re-testing shall be accomplished at no additional cost to the District.

1.14 WARRANTY

- A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Contracting Officer for the District.

1.15 INSTRUCTION

- A. Instruction to designated Government personnel shall be provided for the particular equipment or system as required in each associated technical specification section.

- B. Furnish the services of competent and factory-trained instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be factory-trained in operating theory as well as practical operation and maintenance procedures.
- C. A training schedule shall be developed and submitted by the Contractor and approved by the District at least 30 days prior to the planned training.

END OF SECTION 26 05 11

SECTION 26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures.
- B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with CEC.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 CONDUCTORS AND CABLES

- A. Manufacturers:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. General Cable Corporation.
 - 3. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction and ratings.
- C. Conductor Material: Copper complying with NEMA WC 5 or 7; solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THW, THHN-THWN2 or XHHW2 complying with NEMA WC 5 or 7.
- E. Multiconductor Cable: Metal-clad cable, Type MC with ground wire. MC shall not be used unless approved prior to installation by the school district.

2.3 CONNECTORS AND SPLICES

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. AMP Incorporated/Tyco International.
 - 3. Hubbell/Anderson.
 - 4. O-Z/Gedney; EGS Electrical Group LLC.
 - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type XHHW-2, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN 2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway. Metal-clad cable, Type MC shall not be used without notice of approval from the school district.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN2, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Section 26 05 00 "Common Work Results for Electrical."
- F. Seal around cables penetrating fire-rated elements according to Section 07 84 13 "Penetration Firestopping."
- G. Identify and color-code conductors and cables according to Section 26 05 00 "Common Work Results for Electrical."
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

1.2 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures.
- B. Product Data: For ground rods.
 - 1. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 GROUNDING ELECTRODE SYSTEM

- A. Metal underground water pipe.
- B. Metal frame of the building.
- C. Concrete-encased electrode.
- D. Rod electrode.

1.5 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms.

1.6 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate all resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Include all instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cadweld.
 - 2. Thermoweld.
 - 3. Copperweld Corp.
 - 4. Dossert Corp.
 - 5. Erico Inc.; Electrical Products Group.
 - 6. Galvan Industries, Inc.
 - 7. Harger Lightning Protection, Inc.
 - 8. Hastings Fiber Glass Products, Inc.
 - 9. ILSCO.
 - 10. Kearney/Cooper Power Systems.
 - 11. Korns, C. C. Co.; Division of Robroy Industries.

12. Lyncole XIT Grounding.
13. O-Z/Gedney Co.; a business of the EGS Electrical Group.
14. Burndy "Hyground" compression system
15. Thomas & Betts, compression system

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Section 26 05 19 "Low-Voltage Power Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare, Solid-Copper Conductors: ASTM B 3.
- G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.
- H. Bare, Tinned-Copper Conductors: ASTM B 33.
- I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
- J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- L. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.
- M. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Exothermic-welded type, in kit form, selected per manufacturer's written instructions.
- N. Foundation Electrode: 4/0 AWG.

2.3 ROD ELECTRODES

- A. Ground Rods: Copper-clad steel.
 1. Size: 3/4 inch diameter by 120 inches.
 2. Manufacturer: Blackburn; Eritech; Or equal.

2.4 GROUNDING WELL COMPONENTS

- A. Well Pipe: 12 inch diameter by 24 inches long concrete pipe with belled end.
- B. Well Cover: Cast iron with legend 'GROUND' embossed cover.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

- E. Equipment Grounding Conductors: Comply with CEC, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by CEC are indicated.
 - 1. Install insulated equipment grounding conductors in feeders.
 - 2. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
 - 3. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
 - 4. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - a. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 - b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
 - 1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
 - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- G. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- H. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- I. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - 6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.
- J. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- K. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

3.2 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 2. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
 3. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:
 - a. Equipment Rated 500 kVA and Less: 10 ohms.

- b. Equipment Rated 500 to 1000 kVA: 5 ohms.
- c. Equipment Rated More Than 1000 kVA: 3 ohms.
- d. Manhole Grounds: 10 ohms.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel slotted support systems.
 - 2. Aluminum slotted support systems.
 - 3. Nonmetallic slotted support systems.
 - 4. Conduit and cable support devices.
 - 5. Support for conductors in vertical conduit.
 - 6. Structural steel for fabricated supports and restraints.
 - 7. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
 - 8. Fabricated metal equipment support assemblies.
- B. Related Requirements:
 - 1. Section 26 05 48.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 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 the following:
 - a. Slotted support systems, hardware, and accessories.
 - b. Clamps.
 - c. Hangers.
 - d. Sockets.
 - e. Eye nuts.
 - f. Fasteners.
 - g. Anchors.
 - h. Saddles.
 - i. Brackets.
 - 2. Include rated capacities and furnished specialties and accessories.
- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
 - 1. Hangers. Include product data for components.
 - 2. Slotted support systems.
 - 3. Equipment supports.
 - 4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal: For hangers and supports for electrical systems.
 - 1. Include design calculations and details of hangers.
 - 2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) 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. Suspended ceiling components.
 - 2. Ductwork, piping, fittings, and supports.
 - 3. Structural members to which hangers and supports will be attached.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Items penetrating finished ceiling, including the following:
 - a. Luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Projectors.
- B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.2/D1.2M.

PART 2 - **PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
 - 2. Component Importance Factor: 1.5 or 1.0.
- C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. B-line, an Eaton business.
 - c. ERICO International Corporation.
 - d. Flex-Strut Inc.
 - e. GS Metals Corp.
 - f. G-Strut.
 - g. Haydon Corporation.
 - h. Metal Ties Innovation.
 - i. Thomas & Betts Corporation; A Member of the ABB Group.
 - j. Unistrut; Part of Atkore International.
 - k. Wesanco, Inc.
 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
 4. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches, 13/16 inches.
 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Industries, Inc.
 - b. Flex-Strut Inc.
 - c. Haydon Corporation.
 - d. MKT Metal Manufacturing.
 - e. Thomas & Betts Corporation; A Member of the ABB Group.
 - f. Unistrut; Part of Atkore International.
 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 3. Channel Material: 6063-T5 aluminum alloy.
 4. Fittings and Accessories Material: 5052-H32 aluminum alloy.
 5. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches, 13/16 inches.
 6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c., in at least one surface.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. B-line, an Eaton business.
 - c. Fabco Plastics Wholesale Limited.
 - d. G-Strut.
 - e. Haydon Corporation.
 - f. Seasafe, Inc.; AMICO, a Gibraltar Industries Company.
 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 3. Channel Width: Selected for applicable load criteria 1-5/8 inches, 1-1/4 inches or 13/16 inches.
 4. Fittings and Accessories: Products provided by channel and angle manufacturer and designed for use with those items.
 5. Fitting and Accessory Materials: Same as those for channels and angles, except metal items may be stainless steel.
 6. Rated Strength: Selected to suit applicable load criteria.
 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. 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) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

- a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) B-line, an Eaton business.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All Stainless - steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 05 50 00 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 1. NECA 1.
 2. NECA 101
 3. NECA 102.
 4. NECA 105.
 5. NECA 111.
- B. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC and RMC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 05 50 00 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Section 09 91 13 "Exterior Painting"/Section 09 91 23 "Interior Painting" and Section 09 96 00 "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures.
- B. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with CEC.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer's specified.

2.2 METAL CONDUIT AND TUBING

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Alflex Inc.
 - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 4. Electri-Flex Co.
 - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
 - 6. LTV Steel Tubular Products Company.
 - 7. Manhattan/CDT/Cole-Flex.
 - 8. O-Z Gedney; Unit of General Signal.
 - 9. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Compression type.
- F. FMC: Aluminum.
- G. LFMC: Flexible steel conduit with PVC jacket.
- H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers:
 - 1. American International.

2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 3. Arnco Corp.
 4. Cantex Inc.
 5. Certainteed Corp.; Pipe & Plastics Group.
 6. Condux International.
 7. ElecSYS, Inc.
 8. Electri-Flex Co.
 9. Lamson & Sessions; Carlon Electrical Products.
 10. Manhattan/CDT/Cole-Flex.
 11. RACO; Division of Hubbell, Inc.
 12. Spiralduct, Inc./AFC Cable Systems, Inc.
 13. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating.
1. Manufacturers:
 - a. Airey-Thompson Sentinel Lighting; Wiremold Company (The).
 - b. Thomas & Betts Corporation.
 - c. Walker Systems, Inc.; Wiremold Company (The).
 - d. Wiremold Company (The); Electrical Sales Division.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. Emerson/General Signal; Appleton Electric Company.
 3. Erickson Electrical Equipment Co.
 4. Hoffman.
 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 6. O-Z/Gedney; Unit of General Signal.
 7. RACO; Division of Hubbell, Inc.
 8. Robroy Industries, Inc.; Enclosure Division.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- I. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosures, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors:
 - 1. Exposed: Rigid steel or IMC.
 - 2. Concealed: Rigid steel or IMC.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
 - 1. Exposed: EMT.
 - 2. Concealed: EMT.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 - 4. Damp or Wet Locations: Rigid steel conduit.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- E. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Section 26 05 00 "Common Work Results For Electrical."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 2. Space raceways laterally to prevent voids in concrete.
 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
1. Run parallel or banked raceways together on common supports.
 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
1. Use insulating bushings to protect conductors on all raceways 2" and larger.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by CEC.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- Q. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Set floor boxes level and flush with finished floor surface.
- T. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
 - 5. Silicone sealants.
- B. Related Requirements:
 - 1. Section 07 84 13 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.
 - 2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.

- b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 - 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Carbon steel.
 - 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. HOLDRITE.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. 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 that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.

- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- C.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for raceways, conductors, and warning labels and signs.
 - 2. Labels.
 - 3. Bands and tubes.
 - 4. Tapes and stencils.
 - 5. Tags.
 - 6. Signs.
 - 7. Cable ties.
 - 8. Paint for identification.
 - 9. Fasteners for labels and signs.

1.3 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 electrical identification products.
- B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Comply with NFPA 70E and Section 26 05 73.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.

2. Legend: Indicate voltage.
- B. Color-Coding for Phase- Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 3. Colors for 240-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 4. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 5. Color for Neutral: White.
 6. Color for Equipment Grounds: Bare copper.
 7. Colors for Isolated Grounds: Green with white stripe.
- C. Raceways and Cables Carrying Circuits at More Than 600 V:
 1. Black letters on an orange field.
 2. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."
- D. Warning Label Colors:
 1. Identify system voltage with black letters on an orange background.
- E. Warning labels and signs shall include, but are not limited to, the following legends:
 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
- F. Equipment Identification Labels:
 1. Black letters on a white field.

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. emedco.
 - d. Grafoplast Wire Markers.
 - e. HellermannTyton.
 - f. LEM Products Inc.
 - g. Marking Services, Inc.
 - h. Panduit Corp.
 - i. Seton Identification Products.
- B. Snap-around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. HellermannTyton.
 - c. Marking Services, Inc.
 - d. Panduit Corp.
 - e. Seton Identification Products.
- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. emedco.
 - e. Grafoplast Wire Markers.
 - f. Ideal Industries, Inc.
 - g. LEM Products Inc.
 - h. Marking Services, Inc.
 - i. Panduit Corp.
 - j. Seton Identification Products.
 2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
 3. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 4. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. emedco.
 - e. Grafoplast Wire Markers.
 - f. HellermannTyton.
 - g. Ideal Industries, Inc.
 - h. LEM Products Inc.
 - i. Marking Services, Inc.
 - j. Panduit Corp.
 - k. Seton Identification Products.
 2. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches for raceway and conductors.
 - b. 3-1/2 by 5 inches for equipment.

- c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

- A. Snap-around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. HellermannTyton.
 - c. Marking Services, Inc.
 - d. Panduit Corp.
- B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Panduit Corp.

2.5 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. HellermannTyton.
 - d. Ideal Industries, Inc.
 - e. Marking Services, Inc.
 - f. Panduit Corp.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.
- C. Tape and Stencil: 4-inch-wide black stripes on 10-inch centers placed diagonally over orange background and are 12 inches wide. Stop stripes at legends.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. HellermannTyton.
 - b. LEM Products Inc.
 - c. Marking Services, Inc.

- d. Seton Identification Products.
- D. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carlton Industries, LP.
 - b. Seton Identification Products.
- E. Underground-Line Warning Tape:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Ideal Industries, Inc.
 - c. LEM Products Inc.
 - d. Marking Services, Inc.
 - e. Reef Industries, Inc.
 - f. Seton Identification Products.
 - 2. Tape:
 - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 - 3. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE"
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE"
 - 4. Tag: Type I :
 - a. Pigmented polyolefin, bright colored, compounded for direct-burial service.
 - b. Width: 3 inches.
 - c. Thickness: 4 mils.
 - d. Weight: 18.5 lb/1000 sq. ft.
 - e. Tensile according to ASTM D 882: 30 lbf and 2500 psi.
 - 5. Tag: Type II :
 - a. Multilayer laminate, consisting of high-density polyethylene scrim coated with pigmented polyolefin; bright colored, compounded for direct-burial service.
 - b. Width: 3 inches.
 - c. Thickness: 12 mils.
 - d. Weight: 36.1 lb/1000 sq. ft.
 - e. Tensile according to ASTM D 882: 400 lbf and 11,500 psi.
 - 6. Tag: Type ID :
 - a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the

- continuity of the conductive core; bright colored, compounded for direct-burial service.
 - b. Width: 3 inches.
 - c. Overall Thickness: 5 mils.
 - d. Foil Core Thickness: 0.35 mil.
 - e. Weight: 28 lb/1000 sq. ft.
 - f. Tensile according to ASTM D 882: 70 lbf and 4600 psi.
7. Tag: Type IID :
- a. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, compounded for direct-burial service.
 - b. Width: 3 inches.
 - c. Overall Thickness: 8 mils.
 - d. Foil Core Thickness: 0.35 mil.
 - e. Weight: 34 lb/1000 sq. ft.
 - f. Tensile according to ASTM D 882: 300 lbf and 12,500 psi.
- F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.6 TAGS

- A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.
 - e. Seton Identification Products.
- B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory screened permanent designations; punched for use with self-locking cable tie fastener.
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Grafoplast Wire Markers.
 - e. LEM Products Inc.
 - f. Marking Services, Inc.
 - g. Panduit Corp.
 - h. Seton Identification Products.
- C. Write-on Tags:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Carlton Industries, LP.
 - b. LEM Products Inc.
 - c. Seton Identification Products.
2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.
3. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
4. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. emedco.
 - d. Marking Services, Inc.
2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. emedco.
 - d. Marking Services, Inc.
2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
3. 1/4-inch grommets in corners for mounting.
4. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.
2. Engraved legend.
3. Thickness:
 - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. in., 1/8 inch thick.
 - c. Engraved legend with black letters on white face.

- d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.
- e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. HellermannTyton.
 - 2. Ideal Industries, Inc.
 - 3. Marking Services, Inc.
 - 4. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- H. System Identification for Raceways and Cables over 600 V: Identification shall completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.
- K. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- L. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "EMERGENCY POWER."
 - 2. "POWER."
 - 3. "UPS."
- M. Vinyl Wraparound Labels:
 - 1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
 - 2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- N. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
- O. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- P. Self-Adhesive Labels:
 - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
- Q. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- R. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.
- S. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
- T. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
 - 1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- U. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

- V. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- W. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
 - 2. Limit use of underground-line warning tape to direct-buried cables.
 - 3. Install underground-line warning tape for direct-buried cables and cables in raceways.
- X. Metal Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using general-purpose cable ties.
- Y. Nonmetallic Preprinted Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using general-purpose cable ties.
- Z. Write-on Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using general-purpose cable ties.
- AA. Baked-Enamel Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.
- BB. Metal-Backed Butyrate Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.
- CC. Laminated Acrylic or Melamine Plastic Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.
- DD. Cable Ties: General purpose, for attaching tags, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil. Stencil legend "DANGER - CONCEALED HIGH-VOLTAGE WIRING" with 3-inch-high, black letters on 20-inch centers.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, and at 10-foot maximum intervals.

- D. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Vinyl wraparound labels.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- E. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "EMERGENCY POWER."
 - 2. "POWER."
 - 3. "UPS."
- G. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify the phase.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- H. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags.
- I. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags with the conductor or cable designation, origin, and destination.
- J. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.
- K. Conductors to Be Extended in the Future: Attach write-on tags to conductors.
- L. Auxiliary Electrical Systems Conductor Identification: Marker tape that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- M. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- N. Concealed Raceways and Duct Banks, More Than 600 V, within Buildings: Apply floor marking tape to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
 - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- O. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- P. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- Q. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
 - 1. Apply to exterior of door, cover, or other access.
 - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

- a. Power-transfer switches.
 - b. Controls with external control power connections.
- R. Arc Flash Warning Labeling: Self-adhesive labels.
- S. Operating Instruction Signs: Self-adhesive labels.
- T. Emergency Operating Instruction Signs: Self-adhesive labels with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.
- U. Equipment Identification Labels:
 - 1. Indoor Equipment: Self-adhesive label.
 - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
 - 3. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Switchgear.
 - e. Switchboards.
 - f. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - g. Substations.
 - h. Emergency system boxes and enclosures.
 - i. Motor-control centers.
 - j. Enclosed switches.
 - k. Enclosed circuit breakers.
 - l. Enclosed controllers.
 - m. Variable-speed controllers.
 - n. Push-button stations.
 - o. Power-transfer equipment.
 - p. Contactors.
 - q. Remote-controlled switches, dimmer modules, and control devices.
 - r. Battery-inverter units.
 - s. Battery racks.
 - t. Power-generating units.
 - u. Monitoring and control equipment.
 - v. UPS equipment.

END OF SECTION 26 05 53

SECTION 26 27 26 - WIRING DEVICES

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. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
 - 2. USB charger devices.
 - 3. GFCI receptacles.
 - 4. Twist-locking receptacles.
 - 5. Pendant cord-connector devices.
 - 6. Cord and plug sets.
 - 7. Toggle switches.
 - 8. Decorator-style convenience.
 - 9. Wall switch sensor light switches with ultrasonic sensors.
 - 10. Digital timer light switches.
 - 11. Wall-box dimmers.
 - 12. Wall plates.
 - 13. Floor service outlets.
 - 14. Poke-through assemblies.
 - 15. Prefabricated multioutlet assemblies.
 - 16. Service poles.

1.3 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:
 - 1. Cooper: Cooper Wiring Devices; Division of Cooper Industries, Inc.
 - 2. Hubbell: Hubbell Incorporated; Wiring Devices-Kellems.
 - 3. Leviton: Leviton Mfg. Company, Inc.
 - 4. Pass & Seymour: Pass& Seymour/Legrand.
- B. BAS: Building automation system.
- C. EMI: Electromagnetic interference.
- D. GFCI: Ground-fault circuit interrupter.
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- F. RFI: Radio-frequency interference.
- G. SPD: Surge protective device.
- H. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.
- D. Devices for Owner-Furnished Equipment:
 - 1. Receptacles: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.
- E. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 2. Eaton (Arrow Hart).
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Leviton Manufacturing Co., Inc.
 - c. Pass & Seymour/Legrand (Pass & Seymour).
- B. Hospital-Grade, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: Single-piece, rivet-less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
- C. Isolated-Ground, Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- D. Tamper-Resistant Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

2.3 USB CHARGER DEVICES

- A. Tamper-Resistant, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1310, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Single-piece, rivet-less, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
 3. USB Receptacles: Type A.
 4. Line Voltage Receptacles: two pole, three wire, and self-grounding.
- B. Hospital-Grade, USB Charger Receptacles: 12 V dc, 2.0 A, USB Type A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, UL 1310, and FS W-C-596.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Labeled and complying with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

3. USB Receptacles: Type A.
4. Line Voltage Receptacles: two-pole, three wire, and self-grounding.

2.4 GFCI RECEPTACLES

A. General Description:

1. 125 V, 20 A, straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).

C. Tamper-Resistant, Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Pass & Seymour/Legrand (Pass & Seymour).

D. Hospital-Grade, Duplex GFCI Convenience Receptacles: Comply with UL 498 Supplement sd.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).

2.5 SPD RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1449, and FS W-C-596, with integral SPD in line to ground, line to neutral, and neutral to ground.

1. 125 V, 20 A, straight-blade type.
2. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
3. Active SPD Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

2.6 TWIST-LOCKING RECEPTACLES

A. Twist-Lock, Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
- B. Twist-Lock, Isolated-Ground, Single Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Grounding: Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.7 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.8 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.9 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Eaton (Arrow Hart).

- 2) Hubbell Incorporated; Wiring Device-Kellems.
 - 3) Leviton Manufacturing Co., Inc.
 - 4) Pass & Seymour/Legrand (Pass & Seymour).
 2. Two Pole:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Eaton (Arrow Hart).
 - 2) Hubbell Incorporated; Wiring Device-Kellems.
 - 3) Leviton Manufacturing Co., Inc.
 - 4) Pass & Seymour/Legrand (Pass & Seymour).
 3. Three Way:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Eaton (Arrow Hart).
 - 2) Hubbell Incorporated; Wiring Device-Kellems.
 - 3) Leviton Manufacturing Co., Inc.
 - 4) Pass & Seymour/Legrand (Pass & Seymour).
 4. Four Way:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Eaton (Arrow Hart).
 - 2) Hubbell Incorporated; Wiring Device-Kellems.
 - 3) Leviton Manufacturing Co., Inc.
 - 4) Pass & Seymour/Legrand (Pass & Seymour).
- C. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
- D. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
- E. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- F. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.
- G. GFCI, Non-Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
- H. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Pass & Seymour/Legrand (Pass & Seymour).
 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- I. Toggle Switches: Square Face, 120/277 V, 15 A; comply with NEMA WD 1, UL 20, and FS W-S-896.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.

- c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - J. Lighted Toggle Switches: Square Face, 120 V, 15 A; comply with NEMA WD 1 and UL 20.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated; Wiring Device-Kellems.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: With LED-lighted handle, illuminated when switch is off.
- 2.10 WALL SWITCH SENSOR LIGHT SWITCH, ULTRASONIC
- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Eaton (Arrow Hart).
 - 2. Hubbell Incorporated; Wiring Device-Kellems.
 - 3. Leviton Manufacturing Co., Inc.
 - B. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using ultrasonic technology.
 - 1. Connections: Provisions for connection to BAS.
 - 2. Connections: Hard wired.
 - 3. Connections: Wireless.
 - 4. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
 - 5. Integral relay for connection to BAS.
 - 6. Adjustable time delay of 20 minutes.
 - 7. Able to be locked to Manual-On mode.
 - 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc.
 - 9. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- 2.11 DIGITAL TIMER LIGHT SWITCH
- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Eaton (Arrow Hart).
 - 2. Hubbell Incorporated; Wiring Device-Kellems.
 - 3. Leviton Manufacturing Co., Inc.
 - B. Description: Switchbox-mounted, combination digital timer and conventional switch lighting-control unit, with backlit digital display, with selectable time interval in 10-minute increments.
 - 1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
 - 2. Integral relay for connection to BAS.
- 2.12 WALL-BOX DIMMERS
- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
 - B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
 - 1. 600 W; dimmers shall require no derating when ganged with other devices.
- D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.
- E. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.13 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
 - 4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.

2.14 POKE-THROUGH ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems.
 - 2. Pass & Seymour/Legrand (Pass & Seymour).
 - 3. Square D; by Schneider Electric.
 - 4. Wiremold / Legrand.
- B. Description:
 - 1. Factory-fabricated and -wired assembly of below-floor junction box with multi-channeled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
 - 2. Comply with UL 514 scrub water exclusion requirements.
 - 3. Service-Outlet Assembly: Pedestal type with services indicated complying with requirements in Section 27 15 13 "Communications Copper Horizontal Cabling."
 - 4. Size: Selected to fit nominal cored holes in floor and matched to floor thickness.
 - 5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 - 6. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.
 - 7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables that comply with requirements in Section 27 15 13 "Communications Copper Horizontal Cabling."

2.15 PREFABRICATED MULTIOUTLET ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems.
 - 2. Wiremold / Legrand.
- B. Description:
 - 1. Two-piece surface metal raceway, with factory-wired multioutlet harness.

2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- C. Raceway Material: Metal, with manufacturer's standard finish.

2.16 FINISHES

- A. Device Color:
 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
 2. Wiring Devices Connected to Emergency Power System: Red.
 3. SPD Devices: Blue.
 4. Isolated-Ground Receptacles: Orange.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pig-tailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
 1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
 2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
 1. Install dimmers within terms of their listing.
 2. Verify that dimmers used for fan-speed control are listed for that application.
 3. Install unshared neutral conductors online and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- C. Perform the following tests and inspections:
 1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
 2. Test Instruments: Use instruments that comply with UL 1436.
 3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- D. Tests for Convenience Receptacles:
 1. Line Voltage: Acceptable range is 105 to 132 V.
 2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 3. Using the test plug, verify that the device and its outlet box are securely mounted.

- E. Wiring device will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 26 27 26

SECTION 27 05 53 - IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for labels and signs.
 - 2. Labels.
 - 3. Bands and tubes.
 - 4. Tapes.
 - 5. Signs.
 - 6. Cable ties.
 - 7. Fasteners for labels and signs.

1.3 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 communications identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with NFPA 70 and TIA 606-B.
- B. Comply with ANSI Z535.4 for safety signs and labels.
- C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Equipment Identification Labels:
 - 1. Black letters on a white field.

2.3 LABELS

- A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. emedco.
- B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. HellermannTyton.
 - c. Marking Services, Inc.
- C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible labels with acrylic pressure-sensitive adhesive.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
 3. Marker for Labels: Permanent, waterproof black ink marker recommended by tag manufacturer.
 4. Marker for Labels: Machine-printed, permanent, waterproof black ink recommended by printer manufacturer.
- D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 2. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches for raceway and conductors.
 - b. 3-1/2 by 5 inches for equipment.
 - c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

- A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. HellermannTyton.
 - c. Marking Services, Inc.
 - d. Panduit Corp.

2.5 UNDERGROUND-LINE WARNING TAPE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. Brady Corporation.

2. Ideal Industries, Inc.
3. LEM Products Inc.
- B. Tape:
 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground communications utility lines.
 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- C. Color and Printing:
 1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.
 2. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL-FIBER CABLE.
- D. Tag: Type I:
 1. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
 2. Width: 3 inches.
 3. Thickness: 4 mils.
 4. Weight: 18.5 lb/1000 sq. ft.
 5. Tensile according to ASTM D 882: 30 lbf and 2500 psi.

2.6 SIGNS

- A. Baked-Enamel Signs:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. emedco.
 2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
 3. 1/4-inch grommets in corners for mounting.
 4. Nominal Size: 7 by 10 inches.
- B. Metal-Backed Butyrate Signs:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. emedco.
 - d. Marking Services, Inc.
 2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
 3. 1/4-inch grommets in corners for mounting.
 4. Nominal Size: 10 by 14 inches.
- C. Laminated-Acrylic or Melamine-Plastic Signs:
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.
2. Engraved legend.
3. Thickness:
 - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. in., 1/8 inch thick.
 - c. Engraved legend with black letters on white face.
 - d. Self-adhesive.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

- A. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F according to ASTM D 638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F.
 5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.
- G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- H. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches from cable end.
- I. Snap-Around Labels:
 1. Secure tight to surface at a location with high visibility and accessibility.
 2. Provide label 6 inches from cable end.
- J. Self-Adhesive Wraparound Labels:
 1. Secure tight to surface at a location with high visibility and accessibility.
 2. Provide label 6 inches from cable end.
- K. Self-Adhesive Labels:
 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
- L. Snap-Around, Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
- M. Underground-Line Warning Tape:
 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench **or concrete envelope** exceeds 16 inches overall.
 2. Limit use of underground-line warning tape to direct-buried cables.
 3. Install underground-line warning tape for direct-buried cables and cables in raceways.
- N. Cable Ties: General purpose, except as listed below:
 1. Outdoors: UV-stabilized nylon.
 2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.
 1. System legends shall be as follows:
 - a. Telecommunications.
- D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation composed of the following, in the order listed:
 1. Wiring closet designation.
 2. Colon.
 3. Faceplate number.
- E. Equipment Room Labeling:
 1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.

2. Patch Panels: Label individual rows and outlets, starting at to left and working down, with self-adhesive labels.
3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:
 - a. Room number being served.
 - b. Colon.
 - c. Faceplate number.
- F. Backbone Cables: Label each cable with a self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.
- G. Horizontal Cables: Label each cable with a self-adhesive wraparound label indicating the following, in the order listed:
 1. Room number.
 2. Colon.
 3. Faceplate number.
- H. Locations of Underground Lines: Underground-line warning tape for copper, coaxial, hybrid copper/fiber, and optical-fiber cable.
- I. Instructional Signs: Self-adhesive labels.
- J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Baked-enamel warning signs.
 1. Apply to exterior of door, cover, or other access.
- K. Equipment Identification Labels:
 1. Indoor Equipment: Laminated-acrylic or melamine-plastic sign.
 2. Outdoor Equipment: Laminated-acrylic or melamine-plastic sign.
 3. Equipment to Be Labeled:
 - a. Communications cabinets.
 - b. Uninterruptible power supplies.
 - c. Computer room air conditioners.
 - d. Fire-alarm and suppression equipment.
 - e. Egress points.
 - f. Power distribution components.

END OF SECTION 27 05 53

SECTION 27 13 20 - DATA COMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish and install a complete data communications system. The system shall consist of but not limited to cables (twisted-pair copper), innerduct, patch panels, fiber interconnect equipment, connectors (fiber and copper), wiring blocks and telecommunications outlets and any other equipment and accessories as required. The work performed under this specification shall be of good quality and performed in a workmanlike manner. In this context "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds. All materials to comply with school district standards.
- B. The copper cabling system shall perform to Category-6e, 6A Permanent Link performance requirements, from patch panel to outlet jack. The system shall be capable for transmission of the Gigabit Ethernet (1000Base-T) protocol and other designed for Category-6e, 6A cabling systems.

1.2 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to work specified in this Section.
- B. Sections 26 00 00, 26 05 00, 27 05 50.
- C. Applicable Standards:
 - 1. ANSI/TIA/EIA-569-A, Commercial Building Standard for Telecommunications Pathways and Spaces.
 - 2. ANSI/TIA/EIA-568-B, Commercial Building Telecommunications Cabling Standard.
 - 3. ANSI/TIA/EIA-568-B.2, Transmission Performance Specifications for 4-Pair 100 Ohm Category 6e, 6A Cabling.
 - 4. TIA/EIA-606-A (2002), Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - 5. J-STND-607-A (2002), Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - 6. EIA/TIA-455-61, FOTP-61, Measurement of Fiber or Cable Attenuation Using an OTDR.
 - 7. IEEE 802.3, Carrier Sense Multiple Access With Collision Detection.
 - 8. CEC Articles 770 and 800.

1.3 CONTRACTOR QUALIFICATIONS

- A. In order to qualify for installation of the data communications system, Contractor must possess the required license classification, a performance history, experience in the installation and termination of fiber optics cable systems, certification from cabling manufacturer, and proof of time in business.
 - 1. License Classification: Contractor must possess a valid C-7 California State Contractor's License. This license must have been issued two years prior to the date of this bid. No other license classification is acceptable.
 - 2. Performance History: Contractor must have successfully performed at least three projects of similar scope, within two years of the date of this bid. Proof of performance shall be in the form of reference sheets which shall include a brief description of the project, the beginning and ending contract price, the project foreman or superintendent's name, and the name, address, and telephone number of a project contact.

3. Fiber Optics Experience: Contractor must be able to prove to the satisfaction of Owner that it has significant experience in the installation of fiber optics cable systems. Installation must include installation of fiber optics cable, fiber termination, a knowledge of interconnect equipment, and a thorough knowledge of testing procedures. Contractor must provide a minimum of 3 references supporting its claim of experience for similar projects within the 2 years prior to this bid. Documentation must be included with the bid documents submitted.
4. Certification from Cabling Manufacturer: Contractor must be able to prove to the satisfaction of the Owner via a certificate that certification in copper and fiber optic product installation has been granted and is current.
5. Time in Business: Contractor must have been in business and in the business of installing telecommunications systems, continuously, for a period of at least three years, prior to the date of this bid. Contractor must submit at least one project reference for each of the three years prior to the date of this bid. These project references shall contain the same information required in Paragraph B above. Contractor must also provide a list of key installation personnel, their hire dates, and a resume of their experience. Key installation personnel shall include at least one foreman and two journey level installers or technicians. By submitting the names of these personnel, Contractor is committing them to the execution of the project outlined in this specification.

1.4 DEFINITIONS

- A. Main Distribution Facility (MDF): The MDF is the location, within a building or complex of buildings, where the entire telecommunications system originates. It may include: The physical location, enclosure, wire and cable management hardware, termination hardware, distribution hardware, and equipment racks. ANSI/TIA/EIA-569-A refers to the room housing the MDF as the "Equipment Room".
- B. Intermediate Distribution Facility (IDF): The IDF is the location in a building where a transition between the backbone or vertical riser system and the horizontal distribution system occurs. It may include: The physical location, enclosure, wire and cable management hardware, termination hardware, distribution hardware, and equipment racks. The IDFs provide the interface location between fiber distribution cable (backbone) and station cable (horizontal distribution).
- C. Backbone Pathway: The Backbone Pathway consists of a series of conduits or chases which connect the MDF to IDFs or IDFs to IDFs. It generally houses the vertical or backbone system.
- D. Backboard: Backboard generally refers to the plywood sheeting lining the walls of telecommunications facilities. Backboard may also refer to the entire wall-mounted assembly, including wire management, wiring blocks, and equipment racks. In this case, the term Backboard is fully interchangeable with SBB or TTB and the equipment required to fulfill the Scope of Work below.

1.5 SYSTEM DESCRIPTION

- A. The data communications system shall consist of active hub equipment, a fiber optics backbone and twisted pair copper work station cabling. The central location shall house an MDF and each of the other locations shall house an IDF. Each fiber optics cable shall originate in the MDF and shall be terminated in its respective IDF. All fiber optic cables shall be enclosed in innerduct which shall be routed through a system of conduits and raceways. From each IDF one or more twisted-pair copper cables shall be routed to each data outlet location. These cables shall originate in an IDF and terminate in its respective data outlet location. The MDF and each IDF will house active data distribution equipment including but not limited to fiber hubs, data terminal

controllers, local area network hubs, fiber optic transceivers, routers, and DSU/CSU devices. Unless specifically noted, active equipment is not within the scope of the work.

1.6 MANUFACTURER

- A. Throughout this specification, manufacturers are cited, along with specific part numbers. These citations are for the purpose of establishing quality and performance criteria.

1.7 SUBMITTALS AND SUBSTITUTIONS

- A. The submission shall consist of five (5) major sections with each section separated with insertable index tabs. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect. Each page in the submission shall be numbered chronologically and shall be summarized in the index. The second section shall include a copy of the Contractor's valid C-7 California State Contractor's License, the information required in Section 1.2 above, and a list of instrumentation to be used for system testing. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment in the specifications. The fourth section shall contain samples of proposed cable markers and labeling. The fifth section shall contain a complete, detailed satellite closet count, workstation, count, and bill-of-materials. Any Contractor failing to include all of the required information shall be deemed non responsive and may be disqualified, at the discretion of the Owner.
- B. For purposes of determining equality, technical and general information set forth on the respective data sheets by manufacturers named for each specified item shall be considered as part of these specifications and binding herein. Any proposed equal item offered shall be substantiated fully to prove equality. The Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by and a copy of the test results by an independent testing laboratory to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.

1.8 FUNCTION AND OPERATION

- A. The intended function of the data communications cable system is to transmit data signals from a central location to several individual data outlet locations.
- B. The multimode fiber optics cable system shall be capable of transmitting signals with a bandwidth per the performance parameters of the specified cable. The cumulative signal loss, through connectors, jumpers, couplers, and fiber cable, shall be no more than the manufacturer's stated dB loss based on cable length and 0.6 dB loss for each connector assembly.
- C. Work station cable, commencing at the wiring blocks, shall be installed in accordance with ANSI/TIA/EIA-568-B.1 standard and shall be capable of transmitting a signal at 155 MBPS with acceptable performance in accordance with Category-6A, 6e performance requirements as specified in ANSI/TIA/EIA-568-B.2-1. The entire work station cable system, including wiring blocks, cable, and telecommunications outlets shall be tested for Category-6 compliance.

PART 2 - **PRODUCT AND INSTALLATION**

2.1 GENERAL

- A. Equipment shall be installed in accordance with the drawings and the manufacturer's requirements. General installation provisions are as follows:
 - 1. Wiring Blocks and Wire Management Components: Where required, wiring blocks and wire management components shall be mounted to the plywood backboard. Each device shall be mounted such that its horizontal dimension is level. In cases where more than

one device is mounted, they shall be aligned vertically. Each device shall be affixed to the plywood backboard by means of screws suitable for fastening to plywood. A minimum of four (4) of the mounting holes provided shall be utilized for fastening.

2. Copper Cable: Where copper cable enters an IDF it shall be affixed to the backboard via "D" Rings and cable ties in accordance with the attached drawings. All cable shall be neatly bundled, combed, and tied. All cable runs, within the IDF shall be horizontal or vertical within the constraints of minimum cable bending radii.
3. Labeling: With exception of work station cables, hand written labels are not acceptable. All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive labels, or type written onto adhesive labels. The font shall be at least one-eighth inch (1/8") in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the background. Patch panels shall exhibit workstation numbers, in sequential order, for all workstations served by the IDF.
 - a. Each telecommunications outlet shall be labeled with its respective work station number (machine labels only). Workstation numbers shall be comprised of the Building Designator-The Room Number-The Station Number (for example A-205-2). Each workstation cable shall be neatly hand labeled, using permanent ink or other permanent labeling medium, at each end with its respective workstation number. Each copper backbone cable shall be machine labeled at each end with its respective IDF number. Each binder group shall be tied off with its respective identifying ribbon at each break-out point.
 - b. For device floor boxes, the label shall be inside the box either on the back of the lid cover or adjacent to the device.

2.2 WORK STATION CABLE & JACKS

A. Description: From each IDF and MDF, provide data cable(s) to each work station (data/VOIP outlets) served.

1. Product: 4 pair #24 or #23 UTP, Category-6e (data), 6A (WAP, CCTV), PVC jacket, third party verified to ANSI/TIA/EIA-568-B. Cables routed between floors or in air plenums shall be CMP plenum rated with same performance parameters. Shall be able to support 100/1000 MBPS TP-PMD/CDDI, 155 bps ATM. SYSTIMAX, Leviton, Ortronics and Panduit
Guaranteed performance at 250 MHz:
 - a. Attenuation = 32.8 dB max.
 - b. NEXT = 38.3 dB min.
 - c. ACR = 5.5 dB min.
 - d. PS NEXT = 36.3 dB min.
 - e. PS ACR = 3.5 dB min.
 - f. ELFEXT = 20.8 dB min.
 - g. PS ELFEXT = 17.8 dB min.
 - h. Return Loss = 17.3 dB min.
2. Required Accessories and Quantities (Hard Wall Locations):
 - a. Wall Plate: Single gang and multi-gang, with designation windows, with blank fillers.
 - b. Category-6e, 6A Jacks.
 - c. Miscellaneous: Provide appropriate modules with appropriate connectors for other system devices.

3. At other than wall installations (i.e., raceways, floor boxes, etc.) provide Category-6e, 6A jacks to fit application.
- B. Installation: Installation shall be conducted in accordance with guidelines established by the product manufacturer and industry standards. Wall plates shall be mounted such that their vertical dimension is plumb. Each wall plate shall be labeled with its respective work station number. Each modular mounting frame shall be labeled with its respective work station number.

2.3 MAIN DISTRIBUTION FACILITIES (MDF)

- A. Description: Existing MDF cabinet.
 1. Products and Quantities:
 - a. Modular Patch Panels: Rack mounted. Up to 24 ports per rack space (1.75"), T568B configuration, in 12 or 24 port increments. One (1) port for each workstation served with a minimum of 12 spare ports is required. Minimum (1) 24 port patch panel. Provide as many patch panels as necessary to service all workstation cables plus the required spare count. CPI, Cooper/B-Line and Panduit.
 - b. Wiring Blocks.
 2. Required Accessories and Quantities:
 - a. Wire Management: One set for each patch panel.
 - b. "D" Rings: Provide and install sufficient quantities of 2" and 3" "D" rings, at 12 inches on center on wall/backboard.
 - c. Modular patch cords. Length as required.
- B. Installation: Installation shall be conducted in accordance with manufacturer's recommendations, industry standards, and this specification. Installation includes complete assembly and mounting of the fiber interconnect equipment, dressing the fiber and copper cables, complete assembly and mounting of the equipment rack, ground bus bar (grounded to nearest grounding system) and mounting of the wiring blocks.

2.4 TESTING AND DOCUMENTATION

- A. Testing: Contractor shall test each pair of twisted-pair copper cable. The Owner reserves the right to have a representative present during all or a portion of the testing process. If the Owner elects to be present during testing, test results will only be acceptable when conducted in the presence of the Owner.
 1. Workstation Cable: Each workstation cable shall be tested from the Jack Panel to the data outlet to ANSI/TIA/EIA-568-B.2-1 Category-6e, 6A performance standards.
 - a. Test Equipment: HP Wirescope 350, Microtest Omniscanner-2 or equivalent. Must meet level III compliance in accordance with ANSI/TIA/EIA-568-B.
 - b. Tests: Signal Attenuation, Noise, Near End Cross-talk (NEXT), ELFEXT, Power sum NEXT, ACR, Return Loss, Cable Length, Propagation Delay and Delay Skew.
 - c. Test Criteria: The system shall be tested to Category-6e, 6A compliance. The test path shall include workstation jacks, station cables, and jack panels (Permanent Link Configuration). Where adapter (patch) cables are specified, the tests shall include the patch cables also (Channel Configuration). The owner reserves the right to have cables replaced and retested if performance parameters are not met.
- B. Documentation: Contractor shall provide documentation to include test results and as-built drawings.
 1. Work Station Cable: The results of the work station cable tests shall be provided in the form of print-outs from the test equipment.
 2. As-Built Drawings: Provide reproducible vellum as-builts, full size indicating each outlet location and designation. Show IDF/MDF locations and cable designations terminated.

2.5 ACCEPTANCE

- A. Acceptance of the Data Communications System, by Owner, shall be based on the results of testing, functionality, and the receipt of documentation. With regard to testing, all fiber segments and all workstation data cables must meet the criteria established. With regard to functionality, Contractor must demonstrate to Owner that specified data signals can be successfully transmitted, bi-directionally, from the MDF/IDF to and from some number of individual data outlets. The number of outlet locations to be tested shall be determined by Owner. With regard to documentation, all required documentation shall be submitted to Owner.

PART 3 - **EXECUTION**

3.1 DIVISION OF WORK

- A. Contractor shall install the data communications system as described in the preceding. Installation shall result in a functional system. The Scope of Work includes:
1. All necessary conduit and raceway.
 2. Necessary trenching, backfill, replacement of landscape material, repair of damage to utilities or structures, replacement of asphalt and base, and replacement or repair to concrete flat work incidental to conduit or raceway installation.
 3. Provide and install all equipment.
 4. Supply and install all material discussed in this specification.
 5. Test and document system, upon completion.
 6. Supply and install all material necessary, whether or not discussed in this specification, to result in a complete and functional system.

END OF SECTION 27 13 20

SECTION 28 31 00 - FIRE ALARM DETECTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, auxiliary control devices and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Local Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
 - 1. The Secondary Power Source of the fire alarm control panel will be capable of providing at least 24 hours of backup power with the ability to sustain 15 minutes in alarm and evacuation at the end of the backup period.
- C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
- D. The FACP and peripheral devices shall be manufactured or supplied 100% by a single U.S. manufacturer (or division thereof).
- E. Underwriters Laboratories Inc. (UL) - USA:
 - 1. No. 38 Manually Actuated Signaling Boxes
 - 2. No. 50 Cabinets and Boxes
 - 3. No. 864 Control Units for Fire Protective Signaling Systems
 - 4. No. 268 Smoke Detectors for Fire Protective Signaling Systems
 - 5. No. 268A Smoke Detectors for Duct Applications
 - 6. No. 346 Waterflow Indicators for Fire Protective Signaling Systems
 - 7. No. 464 Audible Signaling Appliances
 - 8. No. 521 Heat Detectors for Fire Protective Signaling Systems
 - 9. No. 1971 Visual Notification Appliances
- F. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.2 SCOPE

- A. A fire alarm detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance:
 - 1. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style B) as part of an addressable device connected by the SLC Circuit.
 - 2. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y) as part of an addressable device connected by the SLC Circuit.
 - 3. All circuits shall be power-limited, per UL864 requirements.
 - 4. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
 - 5. Alarm signals arriving at the main FACP shall not be lost following a primary power failure or outage of any kind until the alarm signal is processed and recorded.

- C. Basic System Functional Operation: When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
1. The system Alarm LED on the FACP shall flash.
 2. A local sounder with the control panel shall sound.
 3. A backlit 80-character LCD display on the FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 4. In response to a fire alarm condition, the system will process all control programming and activate all system outputs (alarm notification appliances and/or relays) associated with the point(s) in alarm. Additionally, the system shall send events to a central alarm supervising station via either dial-up over PSTN or Internet or Intranet via PSDN or virtual private network.

1.3 SUBMITTALS

A. General:

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications:

1. Provide the services of a qualified technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

1.4 GUARANTY

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.5 MAINTENANCE

- A. Maintenance and testing shall be on a semi-annual schedule or as required by the local AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:
 - 1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
 - 2. Each circuit in the fire alarm system shall be tested semiannually.
 - 3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 10.
- B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

1.6 POST CONTRACT EXPANSIONS

- A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable beam detectors, addressable monitor modules and addressable control modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).
- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.

1.7 APPLICABLE STANDARDS AND SPECIFICATIONS

- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.
 - 1. National Fire Protection Association (NFPA) - USA:
 - a. No. 13 Sprinkler Systems
 - b. No. 70 National Electric Code (NEC)
 - c. No. 72 National Fire Alarm Code
 - d. No. 101 Life Safety Code
 - e. No. 38 Manually Actuated Signaling Boxes
 - f. No. 217 Smoke Detectors, Single and Multiple Stations
 - g. No. 228 Door Closers-Holders for Fire Protective Signaling Systems
 - h. No. 268 Smoke Detectors for Fire Protective Signaling Systems
 - i. No. 268A Smoke Detectors for Duct Applications

- | | | |
|----|----------|--|
| j. | No. 346 | Waterflow Indicators for Fire Protective Signaling Systems |
| k. | No. 464 | Audible Signaling Appliances |
| l. | No. 521 | Heat Detectors for Fire Protective Signaling Systems |
| m. | No. 864 | Control Units for Fire Protective Signaling Systems |
| n. | No. 1481 | Power Supplies for Fire Protective Signaling Systems |
| o. | No. 1610 | Central Station Burglar Alarm Units |
| p. | No. 1638 | Visual Signaling Appliances |
| q. | No. 1971 | Visual Signaling Appliances |
| r. | No. 2017 | General-Purpose Signaling Devices and Systems |
| s. | CAN/ULC | S524-01 Standard for Installation of Fire Alarm Systems |
2. The FACP shall be ANSI 864, 9th Edition Listed. Systems listed to ANSI 864, 8th edition (or previous revisions) shall not be accepted.
 3. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
 4. Local and State Building Codes.
 5. All requirements of the Authority Having Jurisdiction (AHJ).

1.8 APPROVALS

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
 1. FM Factory Mutual
 2. MEA Material Equipment Acceptance (NYC)
 3. CSFM California State Fire Marshal

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.
- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.
- D. All equipment must be available "over the counter" through the Security Equipment Distributor (SED) market and can be installed by dealerships independent of the manufacturer.

2.2 CONDUIT AND WIRE

- A. Conduit:
 1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
 2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
 4. Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
 5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
 6. Conduit shall be 3/4 inch (19.1 mm) minimum.
- B. Wire:
1. All fire alarm system wiring shall be new.
 2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
 3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
 4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR).
 5. Wiring used for the multiplex communication circuit (SLC) shall be twisted and support a minimum wiring distance of 10,000 feet when sized at 12 AWG. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit. Shielded wire shall not be required.
 6. All field wiring (with exception of external communications Ethernet) shall be electrically supervised for open circuit and ground fault.
 7. The fire alarm control panel shall be capable of T-tapping NFPA Style 4 (Class B) Signaling Line Circuits (SLCs). Systems which do not allow or have restrictions in, for example, the amount of T-taps, length of T-taps etc., is not acceptable.
- C. Terminal Boxes, Junction Boxes and Cabinets: All boxes and cabinets shall be UL listed for their use and purpose.
- D. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.

2.3 MAIN FIRE ALARM CONTROL PANEL

- A. Existing Gamewell / FCI E3

2.4 SYSTEM COMPONENTS

- A. See Fire Alarm Equipment Schedule on Drawings.

2.5 BATTERIES

- A. Upon loss of Primary (AC) power to the control panel, the batteries shall have sufficient capacity to power the fire alarm system for required standby time (24 or 60 hours) followed by 15 minutes of alarm and evacuation.
- B. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
- C. If necessary to meet standby requirements, external battery/charger systems may be used.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual pull stations shall be suitable for surface mounting or semi flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST

- A. The service of a competent, NICET level II technician shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 10.
 - 1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 - 2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
 - 3. Verify activation of all waterflow switches.
 - 4. Open initiating device circuits and verify that the trouble signal actuates.
 - 5. Open and short signaling line circuits and verify that the trouble signal actuates.
 - 6. Open and short notification appliance circuits and verify that trouble signal actuates.
 - 7. Ground all circuits and verify response of trouble signals.
 - 8. Check presence and audibility of tone at all alarm notification devices.
 - 9. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
 - 10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
 - 11. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION

- A. At the final inspection, a minimum NICET Level II technician shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor or installing dealer shall provide a user manual indicating "Sequence of Operation."

END OF SECTION 28 31 00

SECTION 32 17 23 – PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 PRINCIPAL WORK IN THIS SECTION

- A. The requirements of the **Owner's** General and Supplementary Conditions, and Division 0 and Division 1 general requirements apply to the work of this Section.
- B. Special provisions apply to the work of this section.
- C. Coordinate the work of this Section with related trades.
- D. Verify applicable extents of work and dimensions at the jobsite.
- E. Furnish materials and perform labor required to execute this work as indicated on the drawings, as specified and as necessary to complete the work.
 - 1. The work includes, but is not limited to the furnishing of all materials and the painting of all asphalt and concrete including:
 - a. Parking Lot Striping and Markings:
 - 1) Parking Stalls
 - a) Standard
 - b) Compact
 - c) Disabled (accessible)
 - d) Motorcycle (TBD)
 - 2) Curb painting as indicated and as directed by Fire Marshall and other traffic markings on pavement as shown and noted on the drawings and specified herein.
 - 3) Access path striping
 - 4) Parking Lettering:
 - a) "Visitor" Refer to drawings
 - b) "C" Compact stalls, refer to drawings
 - c) "No Parking" At Accessible Aisle (loading zone) of disabled parking stalls
 - d) "STOP" Refer to drawings
 - 5) Parking Symbols & Graphics:
 - a) Disabled (accessible) & Van Disabled (accessible) parking stall symbol
 - b) Arrows
 - b. Restriping after seal coat is installed, coordinate with Section 32 12 16 – Asphalt Paving.
- F. Accessories:

1. Truncated Domes, refer to Section(s):
 - a. Section 32 17 26 - Tactile Warning Surfacing

1.2 REFERENCE STANDARDS

- A. 2022 California Code of Regulations (CCR), Title 24, California Building Standards Commission (CBSC) www.bsc.ca.gov current edition at time of permit issuance.
- B. (CCR) Title 24, (CBSC) Chapter 11 – California Green Building Standards Code
 1. Non-residential new construction
 - a. All occupancy types
- C. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines, current version.
- D. Leadership in Energy and Environmental Design (LEED), www.usgbc.org/LEED (United States Green Building Council (USGBC)
 1. Refer to Division 1 for version of LEED Rating System and Reference Guide applicable to project
- E. Collaborative for High Performance Schools (CHPS), www.chps.net

1.3 PERFORMANCE, TESTING AND INSPECTION

- A. Standards:

Item	Name of Test	Performance	Testing Standard
VOC & free of lead, chrome and other heavy or toxic metals	VOC Levels	Comply	State of California & Federal Clean Air Act Amendment, most current adopted edition
Bike Lanes	Configuration		Section 84 of the State of California Department of Transportation (Caltrans) Standard Specifications (Latest Edition)

- B. Sustainability:
 1. Refer to Division 1 sustainability requirements.
 2. Refer to product criteria identified herein.

1.4 SUBMITTALS

- A. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- B. Submit O&M (Operation and Maintenance) manuals in accordance with Division 1 requirements and as herein specified.
- C. Refer to Division 1 for sustainability requirements.

- D. Submit Manufacturers data and shop drawings.

1.5 QUALITY ASSURANCE

- A. Refer to Division 1 for quality control requirements.
- B. Contractor / Installer shall have been in business for Five (5) years providing/finishing similar size projects and complexity.
- C. All pavement markings shall be in accordance with the local fire authority and applicable building codes and jurisdiction having authority.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Refer to Division 1 for product delivery, storage and handling requirements.
- B. Coordinate storage of materials with other trades.
- C. Store materials safely and securely, protected from weather, theft, vandalism or other damage. Prevent damage to or staining of site surfaces on other materials.

1.7 JOB CONDITIONS

- A. Field verify that all components, backing, etc. by others are installed correctly to proceed with installation of products as herein specified.
- B. Conditions for Application: all surfaces must be clean, dry and free from oil, grease, antifreeze, loose sand or aggregate. Do not apply when temperatures are below 50°F. New asphalt and concrete should be allowed to cure for a minimum of 30 days before the application of paint. Any curing compounds used on new concrete must be mechanically abraded off prior to striping. When striping on freshly sealed surfaces, use caution as some sealers can affect the curing and adhesion of traffic paint. If application is over fresh asphalt, the first coat should be no more than (7) wet mils. If applying two coats or overstriping lines with the fire lane, allow the first coat to dry before applying the second coat. Do not apply when rain is forecast. Do not apply when temperature and humidity are near or below the dew point.

1.8 GUARANTEE / WARRANTY

- A. Refer to Division 1 for closeout submittal procedures.
- B. Furnish One (1) year written warranty signed by manufacturer and installer agreeing to repair and/or replace work which has failed as a result of defects in materials or workmanship.
 - 1. Upon notification of **Owner** within the warranty period, such defects shall be repaired and replaced at no cost to the **Owner**.

1.9 RELATED WORK/SECTIONS

- A. Related work includes, but is not limited to, the following:
 - 1. Curb and Gutter Work
 - 2. Coordination with Fire Department having jurisdiction.
- B. Related Sections include, but are not limited to, the following:

1. Division 1
2. Section 03 30 00 - Cast in Place Concrete
3. Section 32 12 16 - Asphalt Paving
4. Section 32 17 26 -Tactile Warning Surfacing
5. Section 10 14 00 - Signage

1.10 OPERATION AND MAINTENANCE DATA

- A. Submit as part of project closeout:
 1. Complete instructions regarding maintenance of the materials, finishes, etc.
 2. Refer to Division 1 for closeout submittal procedures.

1.11 EXTRA MATERIAL

- A. Submit as part of project closeout:
 1. Provide extra material for each product type, color, finish, etc. in same lot as installed product.
 - a. Furnish written certification that extra materials supplied have been inspected and reconfirmed to be the same as those used in the Work.
 2. Provide extra material in unopened fully labeled containers
 - a. Do not supply anything less the full carton containers.
 - b. Furnish in factory packaged and labeled cartons and identify cartons with Project name.
 - c. Deliver materials to project premises just prior to substantial completion, and store at location directed by the **Owner**.
 3. Provide the following:
 - a. (1) one gallon of each paint type and color.

PART 2 - **PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

- A. Single source responsibility, specified items shall be from one manufacturer for each product type.
- B. Acceptable manufacturers shall be one of the following and as herein listed and in Drawings:
 1. Ennis Paint (800) 932-6547 www.ennispaint.net
 2. Bauer, Whittaker
 3. Morton
 4. Reviewed Equivalent by **Architect**.
 - a. Substitutions and deviations shall require **Architect's** approval and shall be given in letterform.

- b. Refer to Division 1 for substitution, deviation and/or submittal procedures.
- c. Proposed alternate products must be equal in terms of chemical composition, color, finish, configuration, performance standards, etc.
- C. All products and materials indicated shall be installed according to current listed specification requirements and manufacturers specifications/recommendations.
- D. Refer to drawings, details, and other related specification section whether listed or not.
- E. Details shall set basic requirements for size and configuration of systems.

2.2 MATERIALS

A. Product:

- 1. Type: High solids, fast drying traffic paint
- 2. Mfgr: Ennis-Flint
- 3. Product: EF Series
- 4. Colors: White, Yellow, Black, Red, Blue, Green
- 5. Coverage: 15 mils

6. Properties:

	White & Yellow	Colors
% Total Solids/Weight	75%	75%
% Total Solids/Volume	58%	58%
Weight % Pigment Solids	58-63%	60-62%
Viscosity in Krebs units	75-85	80-90
Reflectance (Y Value)	84 min (white) 50 min (yellow)	-
Hiding	Complete @ 15 mil	0.92 min (colors), 1.00 min (black)
VOC in g/L	100 max	150 max
Weight per gallon	13.4	-
TiO2	-	0.2 lbs min (blue & green)
Color Match	-	6 Delta E max

- 7. Reflective Beads: Size and quantity as recommended by manufacturer.
- 8. Federal Specs: TT-P-1952E Types I & II
- 9. Coverages: 1 gallon yields 320 feet of 4" stripe @ 15 mils.
- 10. Drying Times: Without drop on glass beads, this paint dries a lab ASTM D711 to no pickup in less than 10 minutes @ 15 mils when ambient and surface temperatures are 77°F or higher at 50+/-5% humidity. When glass beads are applied at a rate of at least 6 pounds per gallon to a 15 mil wet line, the field applied paint will dry to an ASTM D713 no-track in less

than 2 minutes when applied at the weather conditions above.

B. Application:

	Color	Notes
Fire Curbs	Red	Refer to drawings and details for specific configurations and/or color locations.
Parking Stalls	White	
Accessible ISA symbol	White, Blue	
Accessible Aisle	White, Blue	
Accessible Path Striping	White	
Hazardous Location Striping	Yellow	
Traffic Paint	White, Yellow, Red, Blue, Green, Black	

C. Reflective Glass Beads:

1. Mfgr: Ennis-Flint, u.n.o.
 - a. Refer to Civil drawings for type, size and quantity.

D. Thinners

1. Thinners shall be as recommended by the manufacturers for type of paint used.

E. Equipment:

1. All surfaces that come in contact with the paint should be stainless steel, PVC plastic, or a non-reactive material. Galvanized, brass, copper or aluminum will react with the product and clog the equipment. Mild steel will react with the product, but not as severely as the other metals.

PART 3 - EXECUTION

3.1 INSPECTION / EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed.
2. Identify conditions detrimental to proper or timely completion of work and coordinate with **General Contractor** to rectify.

- B. Proceeding with work means the installer accepts the existing conditions and substrates, and any problems related to the existing conditions or substrate shall be repaired to the satisfaction of the **Architect**, without addition cost to the **Owner**.

3.2 COORDINATION

- A. **General Contractor** shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

3.3 PREPARATION

PAVEMENT MARKINGS

- A. Prepare work, substrates, etc. in accordance with manufacturer's recommendations.

3.4 INSTALLATION

- A. General:

- 1. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
 - 2. Install in compliance with authorities having jurisdiction.

- B. Directions for Use:

- 1. Mix thoroughly before using. Thinning is not recommended and should be considered ready for use. Adding water increases the drying time. If thinning is necessary for smaller equipment, add one (1) pint of water per five (5) gallons of paint. Product may be applied at desired mil thickness up to 15 wet mils. Thicker films will be slower drying and may exhibit cracking. Adjust application pressures to get desired mil thickness and line definition. If beaded application is required, apply drop on beads at the rate of four (4) to six (6) pounds per gallon of paint. Do not use organic solvents. All equipment must be clean and flushed with water before applying paints. Do not apply when rain is expected within one hour.

- C. Parking Lot Striping

- 1. Parking lot striping and other markings, such as arrows, "In" and "Out" signs, etc. shall conform to the dimensions and details shown on the Drawings if not indicated, provide shop drawings complying with industry standards.

- D. Stripes And Markings

- 1. All stripes and other markings on pavements, as shown on the Drawings, shall be applied with the use of substantial cutout patterns and templates. All stripes and markings shall be sharp and accurate straight lines, with no fuzziness or waviness at edges of lines.

- E. Method

- 1. Stripes and other markings shall be painted by either of the following methods, at **General Contractor** option: but consistent for all.
 - a. Brush method: Apply by hand, one thorough, heavy coat in accordance with manufacturer's recommendations.
 - b. Spray method: Apply 2 coats, the first being a fog coat and the second being the finish coat.

3.5 COMPLETION

- A. At completion, **General Contractor** shall check his/her work thoroughly and shall touch-up any stripes or markings which are not clear and distinct or which are not uniform in color.

3.6 PROTECTION AND CLEAN UP

- A. Refer to Division 1 for protection and cleaning requirements.

- B. Subcontractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others.
- C. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.
- D. Perform work in accordance with manufacturer's recommendations, as herein specified and in accordance with drawings.
- E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the **Architect** and at no cost to the **Owner**.
- F. After completion of work in this section, remove all erection equipment and implements of service, and debris.
 - 1. Leave entire area in a neat, clean, acceptable condition.
- G. Provide Guarantee/Warranties and Bonds as required in this specification section and as listed in Division 1 closeout submittal procedures.
- H. Provide record drawings in accordance with Division 1 closeout submittal procedures.
- I. Close out, on-site inspection will be at the discretion of the **Architect** after he receives the **General Contractor's NOTICE** of "Certificate of Substantial Completion".

END OF SECTION 32 17 23