

PROJECT MANUAL FOR

CHILD NUTRITION KITCHEN

**MADERA UNIFIED SCHOOL DISTRICT
1902 HOWARD RD.
MADERA, CA 93637**

PREPARED BY:

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ARCHITECT

STRUCTURAL ENGINEER

MECHANICAL ENGINEER

ELECTRICAL ENGINEER

CIVIL ENGINEER

LANDSCAPE ENGINEER

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PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Supplementary Instructions to Bidders consisting of procedures and conditions for the use of documents of various types and formats for bidding of this project.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

- A. Hard Copy Format: Documents printed on paper medium.
- B. Electronic Image Format: Electronic Files consisting of Bid Documents in an image format such as PDF's, TIFF's and etc. These files are to be READ ONLY.

1.3 SUBMITTALS

- A. Submit in accordance with the following:
 - 1. Bidder's Usage Agreement for Bid Documents:
 - a. Hard Copy Format Form.
 - b. Hard Copy and Electronic Image Format Form.
 - 2. Bidder's Usage Agreement for Partial Documents.
 - a. Partial Bid Documents Form.

PART 2 - PRODUCTS
(NOT APPLICABLE)

PART 3 - EXECUTION

3.1 SCHEDULES:

- A. BIDDER'S USAGE AGREEMENT FOR BID DOCUMENTS:
 - 1. HARD COPY FORMAT: When the Bid Documents are being issued in a printed medium, the HARD COPY FORMAT FORM shall be used.

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INSTRUCTIONS TO BIDDERS

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- a. This form shall be submitted and signed as a condition of receiving Bid Documents.
- 2. **HARD COPY AND ELECTRONIC IMAGE FORMAT:** When the Bid Documents are being issued electronically, the **HARD COPY AND ELECTRONIC IMAGE FORMAT FORM** shall be used.
 - a. This form shall be submitted and signed as a condition of receiving Bid Documents.
- B. **BIDDER'S USAGE AGREEMENT FOR PARTIAL BID DOCUMENTS.**
 - 1. When the Bidder is requesting additional documents which are part of the Bid Documents, the **PARTIAL BID DOCUMENTS FORM** shall be used.
 - a. This form shall be submitted and signed as a condition of receiving Partial Bid Documents.

3.2 BIDDER'S USAGE AGREEMENT FOR BID DOCUMENTS HARD COPY FORMAT

Project Name: _____

DA Project No.: _____

I, _____, as duly authorized agent of _____ ("Bidder") as prospective bidder on the above named project ("Project") is requesting a copy of the project BID DOCUMENTS (bidding requirements, contract requirements, specifications, contract drawings, resource drawings if any, and addenda to date).

- A. Bidder is being provided copies of Bid Documents for the Project in a Hard Copy Format, acknowledges that Bid Documents are being provided as the official record set of documents issued for bidding. It is the Bidder's responsibility to review and obtain all information from the Bid Documents necessary for a complete and accurate bid. This request is subject to the following conditions, which the Bidder hereby agrees to abide by:
- B. Bidder shall pay a refundable deposit for the Bid Documents in the amount of \$_____ per set. In the event the Bidder is not the successful bidder, the bidder agrees to return all Bid Documents within 15 calendar days after the bid date. If the Bid Documents are not returned within 15 calendar days after the bid date, the Bidder will forfeit the deposit.
- C. Bidder acknowledges that these Bid Documents will be re-issued as Construction Documents following the bid. The Bidder agrees to return all Bid Documents in "Good Condition" with all the sheets unmarked and in their original order. The returned Bid Documents will be reviewed and the condition of the Bid Documents will be determined. If the Bid Documents are determined to be in "Good Condition", the Bidder's Deposit will be returned.
- D. In the event that the Bid Documents are returned and are not in "Good Condition", the Bidder understands that the Architect and Architect's Consultants will incur certain costs in replacement of missing items and to repair the Bid Documents to their original condition, in order to be issued as Construction Documents. The bidder agrees to pay the Design Team a service fee of \$105.00 an hour (with a two-hour minimum of \$210.00). The service fee will be deducted from the Bidder's deposit, and the remainder refunded to the Bidder.
- E. Bidder understands and agrees the Bid Documents are instruments of Architect's and Architect's Consultants' ("**Design Team**") professional service and are intended for one-time use by Bidder in the bidding of the Project. All information contained in the Bid Documents are and shall remain the property of the Design Team, who is deemed to be the author of the drawings and data, and the Design Team shall retain all common law, statutory law, and all other rights, including copyrights, with respect to Bidder.
- F. The Bidder shall indemnify and hold harmless, the Design Team, its officers, directors, employees or subcontractors, to the fullest extent permitted by law, against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees and defense costs arising out of or resulting from Bidder or any other person or entity that gains information from the Bid Documents or copies any part of the Bid Documents, or uses the Bid Documents or copies any part of the Bid Documents, for purposes other than the bidding of this project, and will be liable to the Design Team for fees equal to the fees paid by the client pursuant to developing the documents for this project.

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DARDEN ARCHITECTS, INC.

Number of Sets Requested: _____

Print Name (Bidder)

Title

Signature

Date:

3.3 BIDDER'S USAGE AGREEMENT FOR BID DOCUMENTS HARD COPY AND ELECTRONIC IMAGE FORMAT

Project Name: _____

DA Project No.: _____

I, _____, as duly authorized agent of _____ ("Bidder") as prospective bidder on the above named project ("Project") is requesting a copy of the project BID DOCUMENTS (bidding requirements, contract requirements, specifications, contract drawings, resource drawings if any, and addenda to date).

- A. Bidder is being provided copies of Bid Documents for the Project, which consists of two parts. One part of the Bid Documents is in the Hard Copy Format ("HCF") and the other part is in the Electronic Image Format ("EIF") on CD-ROM. Bidder acknowledges that HCF Documents and the EIF Documents are being provided as the official record set of documents issued for bidding. It is the Bidder's responsibility to review and obtain all information from both the HCF and the EIF documents necessary for a complete and accurate bid. This request is subject to the following conditions, which the Bidder hereby agrees to abide by:
- B. Bidder shall pay a non-refundable deposit for the Bid Documents in the amount of \$ _____. In the event the Bidder is not the successful bidder, the bidder agrees to permanently dispose of the HCF and EIF on the Project CD-ROM.
- C. Bidder acknowledges that neither the EIF documents nor the CD-ROM will be updated by the Design Team. The CD-ROM contains the original documents and will not be updated regardless of when Bidder obtains the CD-ROM. Any changes to the contract documents will be issued as a separate document.
- D. Bidder is further warned that while the EIF information appears to be extremely accurate, this apparent accuracy is an artifact of the techniques used to generate it and is no way intended to imply actual accuracy. The Bidder acknowledges and takes full responsibility for the accuracy, correctness of measurements, areas, inventories derived, conclusions drawn, and information extracted from the EIF documents.
- E. Bidder understands and agrees the HCF and EIF documents are instruments of Architect's and Architect's Consultants' ("**Design Team**") professional service and are intended for one-time use by Bidder in the bidding of the Project. All HCF and EIF documents are and shall remain the property of the Design Team, who is deemed to be the author of the drawings and data, and the Design Team shall retain all common law, statutory law, and all other rights, including copyrights, with respect to Bidder.
- F. The Bidder shall indemnify and hold harmless, the Design Team, its officers, directors, employees or subcontractors, to the fullest extent permitted by law, against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees and defense costs arising out of or resulting from Bidder or any other person or entity that gains information from the Bid Documents or copies any part of the Bid Documents, or uses the Bid Documents or copies any part of the Bid Documents, for purposes other than the bidding of this project, and will be liable to the Design Team for fees equal to the fees paid by the client pursuant to developing the documents for this project.

SUPPLEMENTARY
INSTRUCTIONS TO BIDDERS

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DARDEN ARCHITECTS, INC.

Description of the HCF Documents and the EIF Documents on CD-ROM, provided:

Print Name (Bidder)

Title

Signature

Date:

3.4 BIDDER'S USAGE AGREEMENT FOR PARTIAL BID DOCUMENTS

Project Name: _____

DA Project No.: _____

I, _____, as duly authorized agent of _____ ("Bidder") as prospective bidder on the above named project ("Project"). The Bidder acknowledge having received at least one (1) complete set of the Bid Documents for the subject project and all Addenda issued to date in either Hard Copy Format ("HCF") and/or an Electronic Image Format ("EIF").

- A. The Bidder is requesting partial copies of the Bid Documents ("Partial Documents") in the format originally issued and that was prepared by the Architect and/or Architect's Consultants ("Design Team") on the subject Project, so that the information therein may be utilized in the Bidder's work on the same project. The Partial Documents are strictly intended for the Bidder's convenience and are not recognized as part of the official record set of Bid Documents issued for bidding. This request is subject to the following conditions, which the Bidder hereby agrees to abide by:
- B. The Bidder shall pay for all costs in reproducing the requested Partial Documents directly to the Printers. In the event that the Bidder is not the successful bidder, the Bidder agrees to permanently dispose of the Partial Documents.
- C. The Bidder recognizes that the value of the Partial Documents far exceeds the cost of printing. The Bidder further agrees that the Bidder will make no other copies of the Partial Documents. Any copying, and/or reuse of the Partial Documents without written authorization of Darden Architects, Inc. is prohibited.
- D. The Bidder understands that the accuracy of the information is an artifact of the techniques used to generate it and is in no way intended to imply actual accuracy. The Bidder agrees that by using these Partial Documents, the Bidder is in no way relieved of the responsibility to review and obtain all information from the complete set of the Bid Documents necessary for a complete and accurate bid.
- E. The Bidder understands and agrees to that any documents provided are instruments of the professional service by the Design Team and are intended for one-time use solely in the bidding of this Project. They shall remain the property of the Architect or the Architect's Consultants, who is deemed to be the author of the documents and who shall retain all common law, statutory law, and all other rights, including copyrights, with respect to the Bidder.
- F. The Bidder shall indemnify and hold harmless, the Design Team, its officers, directors, employees or subcontractors, to the fullest extent permitted by law, against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees and defense costs arising out of or resulting from Bidder or any other person or entity that gains information from the Partial Documents or copies the Partial Documents, or uses the Partial Documents or copies the Partial Documents, for purposes other than the bidding of this project, and will be liable to Design Team for fees equal to the fees paid by the client pursuant to developing the documents for this project.

- G. In the event that the Bidder is a successful bidder, the Bidder agrees that all Bid Documents issued to the Bidder, and Partial Documents obtained by the Bidder, along with any other documents utilized by the Bidder in preparing the bid, will be included in the Escrow Bid Documents when required by the General Conditions. Any and all documents prepared and issued by the Design Team, which are included as part of the Escrow Bid Documents, will be returned to Darden Architects, Inc. at the close of escrow.

DARDEN ARCHITECTS, INC.

Description of the requested documents:

Print Name, (Bidder)

Title

Signature

Dated:

END OF SECTION

SECTION 01 11 13 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included: Construction of the work for **CHILD NUTRITION KITCHEN, MADERA**, California. The work is defined as all material, labor, equipment and services necessary to do all work shown on the drawings and called for in the Specifications. The Work shall be as indicated on the Contract Documents.
- B. This Section includes the following:
 - 1. Summarizes the Work of the Contract.
 - 2. Establishes requirements governing the Work.
 - 3. Identifies the Work that will be performed under separate contracts and the coordination.
 - 4. Project Site access.
 - 5. Restrictions under which the project will be constructed.
- C. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
- D. List below only sections for this Project that the reader might expect to find related work but are specified elsewhere. Verify that the Section titles listed below for this Project's Specifications are correct.
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

- A. The words "OWNER" and "DISTRICT" are synonymous and interchangeable, when used throughout this Project Manual.

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES.
 - 1. Quality Assurance/Control Submittals:
 - a. Certificates:
 - 1) Submit three (3) copies of certificates indicating compliance with the Asbestos Hazard Emergency Regulations Act.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Contractor's Qualifications:
 - a. Contractor shall have experience and have successfully completed three (3) projects of similar scope and size to that indicated for this project.

- b. Contractor shall have demonstrated that they have the resources to perform all of the requirements of this project.

B. Regulatory Requirements:

1. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of Work, and in accordance with Specification Section - REGULATORY REQUIREMENTS:
 - a. CARB 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), in the area where the Project is located.

C. Certifications:

1. The Contractor shall certify in writing that no materials containing Asbestos are incorporated in the work, in accordance with the Asbestos Hazard Emergency Regulations Act.

D. Contractor's Duties:

1. Except as specifically noted, provide and pay for:
 - a. Labor, material and equipment.
 - b. Tools, construction equipment and machinery.
 - c. Heat and utilities required for construction. See Specification Section - TEMPORARY FACILITIES AND CONTROLS.
 - d. Other facilities and services necessary for proper execution and completion of Work.
2. Pay legally required sales, consumer and use taxes.
3. Secure and pay for all site specific as necessary for proper execution and completion of Work.
 - a. Licenses.
 - b. Permits and Fees.
 - c. Government Fees.
 - d. Royalties.
4. Give required notices.
5. Promptly submit written notice to Architect of observed variance.
6. Enforce strict discipline and good order among employees. Do not employ on Work:
 - a. Unfit persons.
 - b. Persons not skilled in assigned task.

1.5 WORK UNDER OTHER CONTRACTS

A. General Requirements:

1. Work under separate contracts will occur throughout the duration of the project. The work being installed under separate contracts will occur around adjacent to the Contract project site.
2. Contractor shall coordinate its work with the work under separate Contracts and shall cooperate with the Contractors of these separate Contracts as they occur.
3. Should the Contractor damage and/or otherwise alter work installed under separate contracts, the Contractor is responsible for the repair and/or correction of installed work.
4. Prior to the installation of the Work, coordinate the work installed or to be installed by separate contracts relative to this project scope of work.

B. Work by Owner:

1. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this contract or work by Owner. Coordinate the work of this Contract with work performed by Owner.
2. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be constructed simultaneously with work under this Contract.
 - a. Items that are Owner Furnished Contractor Installed and Owner Furnished Owner Installed as indicated on the Contract Drawings and as defined in Specification Section - OWNER FURNISHED ITEMS.
3. Security and Intrusion Alarm System: Owner's Vendor will design the Intrusion Alarm System and identify pathways that need to be provided under the Contractor's Construction Contract.

C. Work Under Separate Contracts by Others:

1. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the work of this Contract with work performed under separate contracts.
2. Concurrent Work: Owner will award a separate contract(s) for the following construction operations at the Project Site. Those operations will be conducted simultaneously with work under this Contract.
 - a. Off-Site Development: Construction of the Streets Improvements, Municipal Street Utilities and Public Utilities.
 - b. Off-Site Electrical and Gas Utilities: New Off-Site Electrical and Gas Service will be provided by PG & E up to the boundaries of the site.

1.6 PROJECT CONDITIONS OR SITE CONDITIONS

A. Access to Site:

1. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of the Project.
2. Contractor shall be responsible for coordinating access to and from the site throughout the duration of the project. Access to and from the site may vary, based upon timing and duration of separate contracts.
3. The Contractor shall not use the Off-Site areas, with the exception of the Site Access per Specification Section - TEMPORARY FACILITIES AND CONTROLS, and shall not interfere with the work in these areas.

B. Contractor Use of Premises:

1. Confine operations at sites to areas permitted by:
 - a. Laws.
 - b. Ordinances.
 - c. Permits.
 - d. Contract Documents.
2. Do not unreasonably encumber site with materials or equipment.
3. Assume full responsibility for protection and safekeeping of Contractor's and Owner's material stored on premises, and keep the site and building secure at all times.
4. Obtain and pay for use of additional storage Work areas needed for operations.
5. Limit use of Site Work and storage.

1.7 SCHEDULING

A. The Work of this Project will be constructed under a single contract.

1. It is anticipated that the start of construction will be around:

a. October 2024.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 25 00 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work that is substituted for Work specified in DIVISIONS 02 through 49 shall meet the requirements of this Section.
2. Provide all material, labor, equipment and services necessary to completely install all approved substituted materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
3. See the INSTRUCTIONS TO BIDDERS or the GENERAL CONDITIONS for any time limits set for the submittal of substitutions.
4. Substitutions can be requested in two ways: a. "Prior to Bid Opening", and b. "After Award of the Contract":
 - a. "Prior to Bid Opening": The Contractor or Bidder must insure that proposed substitutions of materials by the Contractor or Bidder are submitted to the Architect's office no later than fourteen (14) calendar days prior to the Bid Opening for review and possible approval of any equipment or materials thought to be equal to or better than those specified in the drawings or specifications. An Addendum will be issued no later than three (3) calendar days prior to Bid Opening including all equipment and materials deemed equivalent to those specified and approved by the Architect.
 - b. "After Award of the Contract": In accordance with the provisions of Section 3400 of the California Public Contract Code, the Contractor awarded the Contract will be provided a period of thirty-five (35) calendar days after the award of the Contract for submission of data substantiating a request for a substitution of "an equal" item or items.

B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:

1. DIVISION 00 SPECIFICATION SECTIONS.
2. DIVISION 01 SPECIFICATION SECTIONS.
3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

- A. Claimant: Bidder, Sub-Contractor, Contractor, Distributor, Supplier, Manufacturer or other entity that is submitting a claim for a substitution.
- B. Substitutions: Substitutions are not a part of the Submittal Process described in Specification Section – SUBMITTAL PROCEDURES. Substitution Requests by a claimant must be reviewed and approved by the Architect before any submittal will be accepted. It is the claimant's responsibility to provide clear and concise documentation to expedite the Architect's review. If the Substitution Request requires re-submission(s) due to the Claimant's inadequate documentation, no time extension will be allowed.
 1. Changes to the structural, accessibility, or life-safety portions of the DSA-approved Contract Documents shall be submitted to and approved by DSA as a Construction Change Document, prior to the fabrication and installation as required by California Administrative Code, Title 24, Part 1, Section 4-338, and DSA IR A-6.
- C. "Or Equal" / "Or Approved Equivalent": Claimant shall request a substitution in accordance with this Specification Section – SUBSTITUTION PROCEDURES.

- D. The Project Manual employs the following methods of specifying products. Claimant shall conform to the directives below for this Project:
1. Product, system or design specified only by reference standards:
 - a. Select any product, system or design meeting reference standards.
 2. Product, system or design specified by naming several products, systems, designs and/or manufacturers:
 - a. Select any product, system, design and/or manufacturer named.
 3. Product, system or design specified by naming several products, systems and/or manufacturers and reference standards:
 - a. Products, systems, designs and/or manufacturer names indicate products, systems, designs and/or manufacturers that (in the Architect's opinion) meets the reference standards.
 - b. Select any of the named manufacturer's products, systems or designs meeting the reference standards.
 4. Product, system or design specified by naming one or more products, systems, designs and stating "or equal to," "or approved equivalent," with the specified products, systems or designs:
 - a. Select product, system or design specified, "or approved equivalent."
 5. Product, system or design specified by naming only one product, system or design:
 - a. Select product, system or design specified, "or approved equivalent."
 6. Product, system or design specified by naming only one product, system or design and followed by the statement "DISTRICT STANDARD – NO SUBSTITUTIONS":
 - a. Provide product, system or design specified. No substitutions allowed.
- E. Cost to Claimant for review of Substitution Request:
1. Each review of a Substitution Request by the Architect and/or it's Consultant(s) will be billed to the Claimant at an hourly rate of **\$212.00** an hour, two hour minimum for each review, whether approved or rejected.
 - a. Waiver of review fees:
 - 1) When the product has been discontinued or is unavailable.
 - a) **EXCEPTION:** Where the claimant has failed to order in a timely manner and waits until the last minute, no consideration of the waiver of fees will be allowed; no time extensions will be allowed.
 - 2) When the Owner has requested a substitution.

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - INSTRUCTIONS TO BIDDERS:
- B. Content of Request:
1. Check made payable to DARDEN ARCHITECTS, INC. for the minimum two hour review period for **\$424.00**, non-refundable.
 - a. When additional time is required to review a substitution request beyond the first two hours, the Architect or its consultants will bill the claimant for the time expended in the review process.
 2. Complete the attached **SUBSTITUTION REQUEST FORM** substantiating compliance of proposed substitution with Contract Documents. **NO OTHER FORMS WILL BE ACCEPTED.**
 3. Attach to the SUBSTITUTION REQUEST FORM an itemized comparison of proposed substitution with product, system or design specified.
 4. For products or systems, attach to the SUBSTITUTION REQUEST FORM:
 - a. Product, system or design identification, including manufacturer's name and address.
 5. Manufacturer's product information: **MUST BE HIGHLIGHTED AND PROJECT SPECIFIC. SUBMITTALS NOT ADEQUATELY MARKED-UP ACCORDING TO PROJECT SPECIFICS WILL BE REJECTED:**

- a. Literature including product, system or design description, performance and test data and reference standards.
 - b. Samples.
 - c. Warranties.
- 6. For construction methods, attach to the SUBSTITUTION REQUEST FORM:
 - a. Detailed description of proposed methods.
 - b. Drawings illustrating methods.
- C. Submit three (3) copies of Substitution Request including all attached data.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Product, system or design qualifications:
 - a. In making a request for substitution, Claimant certifies that:
 - 1) Claimant has personally investigated proposed product, system or design, and determined that it is equal or superior in all respects to that specified.
 - 2) Claimant shall provide the same guarantee or warranty for substitution as for product, system or design specified.
 - 3) Claimant shall coordinate installation of accepted substitution into the Project, making such changes as may be required for the Project to be complete in all respects.
 - 4) Claimant waives all claims for additional costs related to substitution which subsequently become apparent for integrating the substituted product, system or design into the Project.
 - 5) Claimant waives all claims for time extension(s) due to improper documentation requiring re-submission(s) of a Substitution Request Review.
- B. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. Products (and installation standards), systems or methods used for this Project shall comply with CARB standards in effect at the Project Site, and at the time of installation.
- C. Acceptance of Substitutions:
 - 1. Procedures:
 - a. The Contract is based on products, systems or designs described in the Contract Documents.
 - b. Architect will consider proposals submitted in accordance with time limits set within the Specification Section - INSTRUCTIONS TO BIDDERS.
 - c. Architect is solely responsible for judging the acceptance of substitutions.
 - 1) Acceptance of a substitution does not waive the product manufacturer's responsibility for product liability. The Architect will judge (based on the substitution submission data) for function and use – product liability shall remain the responsibility of the product manufacturer.
 - d. Substitute products, systems or designs shall not be used unless the substitutions have been specifically approved for this Project by the Architect.
 - 1) Substitute products, systems or designs that are related to structural, fire and life safety or access compliance shall not be used unless such substitution have been specifically approved for this Project by the Architect and the appropriate authority having jurisdiction.
 - 2. Substitutions will not be considered if:

- a. They are indicated or implied on product submittals in accordance with Specification Section - SUBMITTAL PROCEDURES. Substitutions are not Submittals, and must be reviewed and approved prior to being submitted as a Submittal.
- b. Acceptance will require substantial revision of Contract Documents.
- c. They are submitted after the date set for substitutions within this Contract, unless:
 - 1) The specified or drawing item that has been verified to be discontinued or is otherwise unavailable.
 - 2) The Owner proposes a cost savings for the product, system or method.
 - 3) The Owner proposes early occupancy, and the proposed substitution allows for that convenience.
3. Substitutions affecting DSA-regulated items shall be considered as construction documents (CCD's) and shall be approved prior to fabrication and installation per DSA IR A-6 and Section 338(c) Part 1, Title 24 CCR.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 SCHEDULES

A. Substitution Request Form:

1. See the form attached to the end of this section.
2. The attached form will be reproduced (and sequentially numbered by the Contractor after the award of the Contract) by the Claimant for any and all proposed substitutions.
3. **NO OTHER FORMS WILL BE ACCEPTED.**

(Attachment)

SUBSTITUTION REQUEST FORM

TO: DARDEN ARCHITECTS, INC. _____ Check attached for minimum review \$424.00.
 6790 N. West Avenue
 Fresno, CA 93711

CHECK APPROPRIATE LINE:

_____ Substitution Request Prior to Bid (During Bid Period)
 _____ Product or System Substitution
 _____ Design Change Substitution

_____ Substitution Request After Award of the Contract
 _____ Product or System Substitution
 _____ Design Change Substitution

The Contractor Awarded the Contract for this Project shall assign sequential Substitution Request # below.

Leave blank if submitted during the Bid Period.

SUBSTITUTION REQUEST # _____

WE HEREBY SUBMIT FOR YOUR CONSIDERATION THE FOLLOWING PRODUCT OR METHOD AS SUBSTITUTION FOR THE SPECIFIED OR DRAWING ITEM FOR THIS PROJECT:
 PROJECT: _____

SPECIFIED ITEM: _____

Specification Section #	Page #	Paragraph #	Description
OR			
DRAWING ITEM: _____			

Drawing #	Detail Cut #	Description

PROPOSED CREDIT IF ANY: _____

PROPOSED SUBSTITUTION: _____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.
 Attached data also includes a description of changes to the Contract Documents to which the proposed substitution will require for its proper installation.

SUBSTITUTION PROCEDURES

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The undersigned claimant certifies: (Modifications by the claimant to the following list is cause for automatic rejection without further review)

1. The proposed substitution does not affect dimensions shown on drawings or code requirements indicated.
2. The undersigned claimant shall compensate the Architect at a rate of **\$212.00** an hour, two hour minimum for each review (check for **\$424.00** must be attached to this form), for investigation and comments whether or not the request is approved for changes required to the building design, including engineering design, detailing, and construction costs caused by the requested substitution. The Architect is herein defined as any of those firms or individuals listed by reference on the Drawings, including all Consultants identified herein.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be locally available for the proposed substitution.
5. Attach information for a minimum of three projects where the substitution has been used locally within a 200-mile distance of this project, including names, addresses and telephone numbers of Owners who have accepted this product into their projects.
6. Attach all cost data with explanations if different from Specified or Drawing item. Include in that explanation a discussion on quality of proposed substitution and cost differential.
7. The undersigned claimant shall pay for any subsequent changes in incorporating the proposed substitution that were not apparent at the time of approval into the Work, including compensation to the Architect as described in item 2 above.

The undersigned Claimant(s) declares under penalty of perjury per the California Government Code Section 12650, et seq., that the claim of function, appearance and quality are equivalent or superior to the specified or drawing item, and further know and understand that submission for certification of a false claim may lead to fines, imprisonment and/or other severe legal consequences.

SUBMITTED BY CLAIMANT:

Signature _____
Firm _____

Address _____

Date _____

Telephone _____

ADDITIONAL CLAIMANT SIGNATURE REQUIRED:

**The Contractor or Construction Manager
if submitted after the Award:**

Signature _____

Firm _____

DESIGN CONSULTANT USE ONLY:

☐ Check Not Attached - Not Accepted

☐ Accepted

☐ Accepted as Noted

☐ Not Accepted

☐ Received Past Time Period Allowed by Public Contract Code #3400.

By _____ Date _____

Remarks _____

END OF SECTION

SECTION 01 29 73– SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes the administrative and procedural requirements necessary to prepare and process the following:
 - 1. Schedule of Values
 - a. Schedule of Bid Values.
 - b. Complete Schedule of Values.
 - 2. Unit Price Schedules.
 - 3. Application for Payment with Certification.
- B. Related Requirements: The following Project Manual Sections contain requirements that relate to this section:
 - 1. 01 11 13 SUMMARY OF WORK.
 - 2. 01 21 13 ALLOWANCES.
 - 3. 01 23 00 ALTERNATES.
 - 4. 01 32 16 CONSTRUCTION SCHEDULE.
 - 5. 01 32 26 FORMS AND REPORTS.
 - 6. 01 33 00 SUBMITTAL PROCEDURES.
 - 7. 01 41 00 REGULATORY REQUIREMENTS.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring and controlling the construction project. Activities included in a Schedule of Values and Payment Request consume cost for time and resources.
- B. Activity Code: Identifies each activity so as to be organized, group and sorted into Sub-Schedules, Areas of Work, and Reports.
- C. Allowances: Contract amounts allocated for specific activities of the project as identified in the contract documents.
- D. Application for Payments: A statement furnished by the Contractor allocating portions of the Contract Sum to various portions of the Work stipulating the amount of work that has been completed to date.
- E. Contingency: Contract amounts allocated for non-specific activities, to cover changes in the contract document work, unforeseen conditions and added scope of work to the project.
- F. Major Scope: Significant portions of work identified as, but not limited to, Base Bid, Alternate Bids, and Construction Phases, and Funding Criteria.
- G. Responsible Party: Entity that is responsible for performing the work of each activity as identified, but not limited to, General Contractor, and Sub-Contractor, second and tertiary tier Sub-Contractors, Manufacturers, Fabricators and Vendors.
- H. Schedule of Values: A statement furnished by the Contractor allocating portions of the Contract Sum to various portions of the Work.
- I. Scope Type: Segments of work identified as, but not limited to, Building ID, On-Site, and Off-Site.
- J. Sub-Schedules: Separated activities identified as part of the same element of work and arranged to show correlation with related elements.

- K. Unit Prices: A price per unit of measurement for materials, equipment, or services, or a portion of the Work that are applicable during the duration of the Work.

1.4 SUBMITTALS

- A. General:
1. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES.
- B. Format for Submittals: A tabular form type schedules.
1. Provide a working electronic copy of schedule file.
 - a. Provide schedule files on Compact Disc (CD) or Digital Versatile Disc (DVD) (WINDOWS Formatted Disks) in a form that can be reviewed and used by the Owner, and Architect.
 2. Provide PDF electronic copy of schedule file.
 3. Provide [**Two (2)**] paper copies of schedules.
 - a. Sheet size shall be of adequate size to clearly show the required information for the entire construction period.
 - b. All required documentation shall have the Submittal number posted in the upper-right hand corner of the page.
- C. Assurance/Control Submittals:
1. Schedule of Values.
 - a. Schedule of Bid Values.
 - 1) Submit within [**fourteen (14)**] days after the Award of Contract.
 - b. Complete Schedule of Values.
 - 1) Submit at the earliest possible date, but no later than [**fifteen (15)**] days prior to the date scheduled for submittal of initial Application for Payment.
 2. Application for Payment and Certification.
 - a. Application for Payment and Certification Forms.
 - 1) Submit along with the Complete Schedule of Values submittal.
 - b. Initial Application for Payment.
 - 1) Submit [**seven (7)**] prior to due date.
 - c. Application for Payment for Progress of Work.
 - 1) Submit monthly by the date directed by Owner.
 - d. Application for Payment at Substantial Completion.
 - 1) Submit after Architect issues the Certificate of Substantial Completion.
 - e. Final Application for Payment.
 - 1) Submit after competing Project Closeout requirements.
 3. Schedule of Unit Price.

1.5 SYSTEM DESCRIPTION

- A. General:
1. The Architect considers the project Schedule of Values requirements to be significant to both the Contractor and the Owner. The development, submittal, and acceptance of the Schedule of Values, (Bid and Complete), and subsequent development and maintenance of the Application for Payments must be given high priority.
 - a. No payment will be made without the Architect's review and acceptance of the Schedule of Values.
 - b. Progress payments may be withheld in whole or part should the Contractor fail to comply with the requirements of this section.
 - c. No separate payment will be made to the Contractor for any of the requirements of this section. All such costs shall be part of the Contractor's planned project overhead costs included in its bid.
- B. Performance Requirements:

1. Schedule of Bid Values: The Schedule of Bid Values shall be a breakdown of the Bid(s) submitted in the Bid Proposal and shall include all work that was bid on, regardless the scope of work awarded for construction. The breakdown shall be sufficient for the use by the Owner and Owner's Consultants to evaluate and determine cost of major scopes of work and the value of other owner agreements that are associated with the dollar value of the bid proposal.
 - a. Refer to Specification Section - SUMMARY OF WORK.
 - b. Refer to Specification Section - ALLOWANCES.
 - c. Refer to Specification Section - ALTERNATES.
2. Complete Schedule of Values: Breakdown of the Contract Sum by specific line-item values, based on the individual activities in the Baseline Project Construction Schedules and to be the basis for the development of the Application for Payment.
 - a. Refer to Specification Section - CONSTRUCTION SCHEDULES.
3. Application for Payments: Shall be derived from Baseline Project Construction Schedule utilizing the costs in the Complete Schedule of Values, and from subsequent Project Construction Schedule Updates, reflecting the Work performed as of planned and actual dates.
 - a. Refer to Specification Section - CONSTRUCTION SCHEDULES.
4. Unit Prices: If the Scope of Work or estimated quantities of Work by the Contract Documents is increased or decreased, Unit Prices are added to or deducted from the Contract Sum by appropriate modification.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 1. The Contractor must have the capacity and capability of supporting the project by producing schedule-related data within [**two (2)**] days of request by the Architect, or Owner.
- B. Regulatory Requirements:
 1. In accordance with Specification Section - REGULATORY REQUIREMENTS.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Coordination:
 1. Coordinate preparation of the Schedule of Bid Values with the submitted Bid Proposal and reflect the major scope of work breakdown described in Specification Section -- SUMMARY OF WORK and Specification Section -- ALTERNATES.
 2. Coordinate preparation of the Complete Schedule of Values with the preparation of the Baseline Project Construction Schedule. Refer to Specification Section -- CONSTRUCTION SCHEDULES.
 3. Correlate line items in the Complete Schedule of Values with other required administrative forms and schedules, including, but not limited to, the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittals Schedule.
 - c. Items required to be indicated as separate activities in the Baseline Project Construction Schedule.
- B. Project Information:
 1. Identification: Include the following Project Identification on all Schedule of Values and Application for Payment.
 - a. Project Name and Location.
 - b. Name of Owner and Address.
 - c. Name of Architect and Address.

- d. Architect's Project Number.
- e. Contractor's Name and Address.
- f. Submittal Date.

2.2 SCHEDULE OF BID VALUES

A. Format:

1. Arrange the Schedule of Bid Values in tabular form.
 - a. Provide and identify separate columns to indicate the following;
 - 1) SPECIFICATION SECTION.
 - 2) DESCRIPTION.
 - 3) RESPONSIBLE PARTY.
 - 4) MAJOR SCOPE.
 - 5) DOLLAR VALUE.
 - 6) PERCENTAGE OF THE CONTRACT SUM.
 - b. Provide and identify separate line-items to indicate the following;
 - 1) Activity.
 - 2) Contract Conditions.
 - 3) Allowance(s).
 - 4) Contingency (ies).
 - 5) Grand Totals.

B. Content:

1. SPECIFICATION SECTION: Use the specification section number in the Project Manual Table of Contents to identify and establish each line-item.
2. DESCRIPTION: Provide a description of the work for each line-item associated with the specification section and responsible party.
3. RESPONSIBLE PARTY: Identify the party responsible for performing the work of each line-item associated with the specification section and description.
4. MAJOR SCOPE: Designate Major scope of work as identified and itemized in BID PROPOSAL.
 - a. Provide separate columns for each Major Scope of Work identified.
5. DOLLAR VALUE: Sub-Total of the cost for each activity line-item, with the amounts rounded to the nearest dollar.
 - a. Assign a dollar value for each line-item to each Major Scope of the project excluding General Conditions, General Requirements and General Contractor's Overhead and Profit.
6. PERCENTAGE OF THE CONTRACT SUM: Dollar Value as a percentage of the Contract Sum to the nearest one-hundredth percent, adjusted to total one hundred percent.
7. Activity: Provide at least one activity item-line for the work in each Specification Section.
 - a. Provide separate activity line items for each Contractor or Subcontractor providing work under the same specification section.
8. Contract Conditions:
 - a. Identify and provide separate activity line-item for cost items that are directly related to Division 01 - GENERAL REQUIREMENTS.
 - b. Identify and provide separate activity line-item for cost items that are directly related to Division 00 - CONDITIONS OF THE CONTRACT.
9. Allowances: Identify and provide separate activity line-item for each Allowance that is assigned for specific work in any specification section. Dollar value to exclude General Contractor's Overhead and Profit.
10. Contingencies: If required, identify and provide separate activity line-item for each Contingency that is not assigned to specific work in any specification section. Dollar value to exclude General Contractor's Overhead and Profit.

- a. If required, provide separate line items for Owner Contingency and Contractor Contingency.
11. Grand Total: Summation of dollar value for each column equal to the Bids received.

2.3 COMPLETE SCHEDULE OF VALUES

A. Format:

1. Provide a comprehensive, fully developed, detailed Complete Schedule of Values in tabular form.
 - a. Provide and identify the following separate columns to indicate the following for each item listed;
 - 1) SPECIFICATION SECTION.
 - 2) ACTIVITY CODE.
 - 3) DESCRIPTION.
 - 4) RESPONSIBLE PARTY.
 - 5) MAJOR SCOPE.
 - 6) SCOPE TYPE.
 - 7) DOLLAR VALUE.
 - b. Provide and identify separate line-items to indicate the following;
 - 1) Activity.
 - 2) Sub-Schedules.
 - 3) Contract Conditions.
 - 4) Allowances.
 - 5) Purchase Contracts.
 - 6) Contingencies.
 - 7) Grand Totals.

B. Content:

1. SPECIFICATION SECTION: Use the specification section number in the Project Manual Table of Contents to identify and establish each line-item.
2. ACTIVITY CODE: Provide the Activity Identification Code for each line-item indicated as separate activities in the Baseline Project Construction Schedule.
3. DESCRIPTION: Provide a description of the work for each line-item associated with the specification section and responsible party.
4. RESPONSIBLE PARTY: Identify the party responsible for performing the work of each line-item associated with the specification section and description.
5. MAJOR SCOPE: Designate Major scope of work as identified and itemized in BID PROPOSAL
6. SCOPE TYPE: Identify each line-item that is associated with a segment of work.
7. DOLLAR VALUE: Sub-Total of the cost for each activity line-item, with the amounts rounded to the nearest dollar.
 - a. Assign a dollar value for each line-item to each Major Scope of the project excluding General Conditions, General Requirements and General Contractor's Overhead and Profit.
8. Activity: Provide at least one activity item-line for the work in each Specification Section.
 - a. Provide separate activity line items for each Contractor or Subcontractor providing work under the same specification section.
 - b. Include entities responsible for performing the work of each activity, identified as, but not limited to, General Contractor, and Sub-Contractor, second and tertiary tier Sub-Contractors, Manufacturers, Fabricators and Vendors.
 - c. Include separate activity line-items for cost items that are directly related to Division 01 - GENERAL REQUIREMENTS and are direct cost of actual work-in-place. Such items shall be, but not limited to, the following;
 - 1) Submittals,

- 2) Field Engineering,
- 3) Operation and Maintenance Manuals.
- 4) Demonstration and Training.
9. Sub-Schedules:
 - a. Major Scope of Work: Provide Sub-Schedules for line-items that are associated with each designated major scope of work as identified in Bid Proposal, and defined in Specification Section -- SUMMARY OF WORK and Specification Section -- ALTERNATES that requires itemization of each line-item value.
 - b. Scope Type: Provide Sub-Schedules for line-items that are associated with each specific scope type.
 - 1) Building Costs: Detailed cost breakdown of all cost items that are directly related to the Project per Building.
 - a) When the Project Building(s) is of sufficient size to warrant, break the building costs down into areas of work compatible with the Contractor's Means and Methods for construction sequences.
 - b) Building areas may consist of floor and roof levels and partial floor and roof levels.
 - 2) Project Site Costs: Detailed cost breakdown of all cost items that are directly related to the Project Site.
 - a) When the Project Site is of sufficient size to warrant, break the site costs down into areas of work compatible with the Contractor's Means and Methods for construction sequences.
10. Contract Conditions: As defined in the Schedule of Bid Values and the following;
 - a. Expand to include separate activity line-items for cost items that are directly related to Division 01 - GENERAL REQUIREMENTS and are not direct cost of actual work-in-place. Such items shall be, but not limited to, the following;
 - 1) Temporary Facilities.
 - 2) Field Supervision.
 - 3) Project Identification Sign.
 - 4) Project Closeout Requirements.
 - a) Punch List Activities, and Project Record Documents.
 - b. Expand to include separate activity line-item for cost items that are directly related to Division 00 - CONDITIONS OF THE CONTRACT REQUIREMENTS and are not direct cost of actual work-in-place. Such items shall be, but not limited to, the following;
 - 1) On-Site Facilities and Supervision.
 - 2) General Contractor's Overhead and Profit.
 - 3) Performance and Labor and Material Bonds.
11. Allowances: Identify and provide separate activity line-item for each Allowance that is assigned for specific work in any specification section. Dollar value to exclude General Contractor's Overhead and Profit..
12. Purchase Contracts: Provide separate line-item in the Schedule of Values for each Purchase Contract, showing the value of the Purchase Contract.
13. Contingencies: If required, identify and provide separate activity line-item for each Contingency that is not assigned to specific work in any specification section. Dollar value to exclude General Contractor's Overhead and Profit.
 - a. If required, provide separate line items for Owner Contingency and Contractor Contingency.
14. Grand Total: Summation of dollar value for each column equal to the Bids received.

2.4 UNIT PRICES

- A. Unit Prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead and profit.

1. Breakdown prices into:
 - a. Delivered cost of products(s) including tax.
 - b. Total installed cost excluding overhead and profit.
 - c. Add Contractor's and subcontractor's overhead and profit costs after subtotal and provide a final total.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of Unit Prices. Methods of measurement and payment for Unit Prices are specified in those sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established Unit Prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to the Contractor.

PART 3 - EXECUTION

3.1 APPLICATION AND CERTIFICATION FOR PAYMENT

- A. General Requirements:
 1. Coordination: Coordinate the preparation of the Application for Payment with the preparation of the Complete Schedule of Values and Project Construction Schedule.
 - a. Entries shall match data on the Complete Schedule of Values and Project Construction Schedule and Project Schedule Updates, if revisions were made.
 2. Application and Certification for Payment Forms: Use forms accepted by the Architect and Owner for Applications for Payment.
 - a. Form shall be based on AIA Document G702 Application and Certification for Payment and AIA Document G703 Continuation Sheets.
 - b. Submit form for acceptance with initial submittal of Complete Schedule of Values.
 3. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of the Contractor. Project Inspector or Architect will return incomplete applications without action.
 - a. Use signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include Waivers of Lien and similar attachments if required.
 4. Identification: Include the following Project Identification on all Application for Payment:
 - a. Project Name and Location.
 - b. Owner Name.
 - c. Architect's Project Number.
 - d. Contractor Name and Address.
 - e. Application Number.
 - f. Application Date.
 - g. Period To:
- B. Format.
 1. Provide a comprehensive, fully developed, detailed Application for Payment with Continuation Sheets in tabular form.
 - a. Provide and identify the following separate columns to indicate the following for each item listed;
 - 1) ACTIVITY CODE.
 - 2) DESCRIPTION.
 - 3) SCHEDULED DOLLAR VALUE.
 - 4) WORK COMPLETED.
 - a) FROM PREVIOUS APPLICATION.
 - b) THIS PERIOD.
 - 5) TOTAL COMPLETED.

- 6) PERCENTAGE OF COMPLETION.
 - 7) BALANCE TO FINISH.
 - 8) RETAINAGE.
- b. Provide and identify separate line-items to indicate the following the following;
 - 1) Activity.
 - 2) Sub-Schedules.
 - 3) Contract Conditions.
 - 4) Allowance(s).
 - 5) Purchase Contracts (if applicable).
 - 6) Contingency (ies).
 - 7) Grand Totals.
 - 8) Change Orders.

C. Content:

- 1. ACTIVITY CODE: Provide the Activity Identification Code for each line-item of Work as indicated as separate activities in the Project Construction Schedule.
- 2. DESCRIPTION OF WORK: Provide the same description as indicated in the Schedule of Values for each line item.
- 3. SCHEDULED DOLLAR VALUE: Provide the same amount as indicated in the Schedule of Values for each line item.
- 4. WORK COMPLETED: with the following sub-columns.
 - a. FROM PREVIOUS APPLICATION, include Dollar Value for work completed in previous Application for Payment, whether or not payment has been received.
 - b. THIS PERIOD, include only the Dollar Value for work completed at the time of Application for Payment.
- 5. TOTAL COMPLETED: The sum Dollar Value of Work Completed and Materials Presently Stored.
- 6. PERCENTAGE OF COMPLETION: The percentage value of the total Work Completed and the Stored to Date divided by the Scheduled Value.
- 7. BALANCE TO FINISH: The dollar value of the Scheduled Value minus the Total Completed.
- 8. RETAINAGE: The dollar value of the percentage of retention per contract agreement.
- 9. Activity:
 - a. Use the Complete Schedule of Values and Baseline Project Schedule as a guide to establish activity line-items for the Application for Payment.
 - b. Include separate activity line-items when a work activity is separated into stages and requires separate payments for each stage.
 - c. Provide separate line-items for each part of the Work where separate payments will be requested including, but not limited to, submittals, materials, equipment, fabrication and installation.
 - d. Provide separate line items for materials stored but not yet installed, where separate payments will be requested.
- 10. Sub-Schedules: As described in the Complete Schedule of Values.
- 11. Contract Conditions: As described in the Complete Schedule of Values.
- 12. Allowances: As described in the Complete Schedule of Values.
- 13. Purchase Contracts: As described in the Complete Schedule of Values
 - a. Indicate Owner payments or deposits, if any, and balance to be paid by the Contractor.
- 14. Contingencies: As described in the Complete Schedule of Values.
- 15. Grand Totals: As described in the Complete Schedule of Values.
- 16. Change Orders:
 - a. Include amounts of approved Change Orders or Construction Change Directives issued before the last day of construction period covered by application.

D. Supplemental Information:

1. Materials Stored: Include in Application for Payment the amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
 - b. Provide certificate of insurance or Bonded Warehousing, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 - c. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - d. Provide summary documentation for stored materials indicating the following:
 - 1) Materials previously stored and included in previous Applications for Payment.
 - 2) Work completed for this Application utilizing previously stored materials.
 - 3) Additional materials stored with this Application.
 - 4) Total materials remaining stored, including materials with this Application.
 2. Waivers of Mechanic's Lien: With each Application for Payment, submit Waivers of Mechanic's Liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 - a. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - b. When an Application shows completion of an item, submit conditional final or full waivers.
 - c. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - d. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 - e. Waiver Forms: Submit waivers of lien on forms executed in a manner acceptable to Owner.
- E. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for payment include the following:
1. List of Subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products List (preliminary if not final).
 5. Schedule of Unit Prices.
 6. Submittal Schedule (preliminary if not final).
 7. List of Contractor's Staff Assignments.
 8. List of Contractor's Principal Consultants.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial Progress Report.
 11. Report of Preconstruction Conference.
- F. Application for Payment for Progress of Work:
1. Each Application for Payment shall be consistent with previous applications and payments as certified by the Project Inspector, Architect, and paid for by the Owner.
 2. Payment Applications shall be submitted to the Architect by the date established by the Owner. The maximum period of time covered by each Application for Payment is for one month.
 3. Payments Applications shall be updated to reflect any revised activity in the Project Schedule Updates.
- G. Application for Payment at Substantial Completion: After the issuing of the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portions of the Work claimed as substantially complete.
1. Include documentation supporting the claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- H. Final Application for Payment: Submit Final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement accounting for final changes to the Contract Sum.
 4. "Contractor's Affidavit of Payment of Debts and Claims."
 5. "Contractor's Affidavit of Release of Liens."
 6. "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

3.2 SCHEDULE OF UNIT PRICES

- A. Specification Section - CAST-IN-PLACE CONCRETE:
 1. Concrete slabs per thickness per square foot.
 2. Concrete foundations per cubic yard.
 3. Concrete walls per cubic yard.
- B. Specification Section - PLUMBING:
 1. Utility trenching, pipe placement and backfill per pipe diameter size per linear foot at specific trench depths.
- C. Specification Section - ELECTRICAL:
 1. Utility trenching, sleeve pipe or conduit pipe placement and backfill per pipe diameter size per linear foot at specific trench depths.
- D. Specification Section - COMMUNICATIONS:
 1. Utility trenching, sleeve pipe or conduit pipe placement and backfill per pipe diameter size per linear foot at specific trench depths.
- E. Specification Section - ELECTRONIC SAFETY AND SECURITY:
 1. Utility trenching, sleeve pipe or conduit pipe placement and backfill per pipe diameter size per linear foot at specific trench depths.
- F. Specification Section - EARTHWORK:
 1. Scarification and compaction of existing soil per cubic yard.
 2. Excavation and compacted placement of existing suitable site soil for non-engineered fill per cubic yard.
 3. Delivery and compacted placement of import soil per cubic yard.
 4. Delivery and compacted placement of import soil for grading per cubic yard.
 5. Rough grading per square foot.
 6. Finish grading per square foot.
- G. Specification Section - STORM DRAINAGE:
 1. Delivery and installation of catch basins per individual catch basin size.
 2. Trenching, pipe placement and backfill per pipe diameter size per linear foot at specific trench depths.
 3. Miscellaneous storm drainage items per item.

END OF SECTION

SECTION 01 31 13 – CONTRACTOR'S PROJECT MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the administrative and procedural provisions for construction operations.
- B. Related Sections:
 - 1. DIVISION 00 SPECIFICATION SECTIONS, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. CAD: Computer Aided Design and Drafting.
- C. RFI: Request for Information. Seeking information required by or clarifications of the Contract Documents.
- D. MINUTES: A method of documenting key topics discussed with a focus on decisions made and directions given and by whom during a meeting. A verbatim transcript is not necessary.

1.3 SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
- B. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities, list telephone numbers, and e-mail addresses. Provide names, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project. Keep list available and current at all times.

1.4 COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in the Contract Documents to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Coordination of Multiple Contracts: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in the Contract Documents that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.
- D. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- E. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
- 1.5 DIGITAL PROJECT MANAGEMENT PROCEDURES
- A. Architect's Data Files Not Available: Architect will not provide Architect's CAD drawing digital data files for Contractor's use during construction.
- B. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect, if available, for Contractor's use during construction, as per written request made by the Contractor.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 3. Digital Drawing Software Program: Contract Drawings are available in Auto CAD.
 4. Contractor, and other parties granted access by Contractor to Architect's digital data files, shall execute attached data licensing agreement form "USER AGREEMENT FOR ELECTRONIC FILES."
- C. Web-Based Project Management Software Package: Use of Contractor' web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion, is acceptable.
1. Web-based Project management software includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.
 - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
 2. Provide up to seven (7) Project management software user licenses for use by users as identified by Owner and Architect.
 3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- D. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with bookmarks enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.
 4. Do not submit password protected documents or restricted documents.

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. RFIs submitted to Architect by other parties controlled by Contractor will be returned without response.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in work.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Owner name.
 - 3. Owner's Project number.
 - 4. Name of Architect.
 - 5. Architect's Project number.
 - 6. Date.
 - 7. Name of Contractor.
 - 8. RFI number, numbered sequentially.
 - 9. RFI subject.
 - 10. Specification Section number and title and related paragraphs, as appropriate.
 - 11. Drawing number and detail references, as appropriate.
 - 12. Field dimensions and conditions, as appropriate.
 - 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 14. Contractor's signature.
 - 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Use forms accepted by the Architect and Owner. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 - 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
 - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal.

- a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within five (5) days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include not less than the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number, including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three (3) days if Contractor disagrees with response.

1.7 COORDINATION DRAWINGS

- A. Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 - 1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Above Ceiling: Indicate subframing for support of ceiling, and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenums to accommodate layout of light fixtures, fire sprinklers, mechanical ducts, support structures, structural elements (beams, joist, trusses) and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire-Protection System: Show the following: Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Site Utility Coordination: Show the following:
 - a. Existing and proposed underground and surface utility improvements including gas, domestic water, fire water, chilled water, hot water, irrigation, storm sewer, sanitary sewer, electrical power, and communications. No site improvements shall be installed prior to Architect's and Owner's review of coordination drawing. Architect's and Owner's review is only for general conformance with the Contract Documents. Contractor is responsible to obtain their own GPR Services to locate utilities within the construction site area.
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Structural Steel, Wood Framing, Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
 2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
 3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
 4. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.

5. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
6. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.

D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format:
 - a. Same digital data software program, version, and operating system as original Drawings, operating in Microsoft Windows operating system.
2. File Submittal Format: Submit or post coordination drawing files using PDF format, or in a format as requested by the Architect.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conduct matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Introductions, responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Review of General Conditions/Requirements.
 - i. Procedures for processing field decisions and Change Orders.
 - j. Procedures for RFIs.
 - k. Procedures for Submittals.
 - l. Procedures for Substitutions.
 - m. Procedures for testing and inspecting.
 - n. Procedures for processing Applications for Payment.
 - o. Distribution of the Contract Documents.
 - p. Submittal procedures.
 - q. Sustainable design requirements.
 - r. Preparation of Record Documents.

- s. Use of the premises.
 - t. Work restrictions.
 - u. Working hours.
 - v. Owner's occupancy requirements.
 - w. Responsibility for temporary facilities and controls.
 - x. Procedures for moisture and mold control.
 - y. Procedures for disruptions and shutdowns.
 - z. Construction waste management and recycling.
 - aa. Parking availability.
 - bb. Office, work, and storage areas.
 - cc. Equipment deliveries and priorities.
 - dd. Project Safety.
 - ee. Security.
 - ff. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Owner and Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conduct matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Coordination of separate contracts.
 - l. Owner's partial occupancy requirements.
 - m. Installation of Owner's furniture, fixtures, and equipment.
 - n. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conduct matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.

- 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Status of sustainable design documentation.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of Proposal Requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conduct matters relating to the Work. Advise Owner and Architect of scheduled meeting dates.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site use.

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- 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of RFIs.
 - 14) Proposal Requests.
 - 15) Change Orders.
 - 16) Pending changes.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS
NOT APPLICABLE

PART 3 - EXECUTION
NOT APPLICABLE

END OF SECTION

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**USAGE AGREEMENT FOR ELECTRONIC FILES
Release of Liability**

Documents Transmitted By: **Darden Architects, Inc.**
 6790 N. West Ave.
 Fresno CA 93711

PROJECT NAME: _____

ARCHITECT PROJECT NO.: _____

PROJECT ARCHITECT: _____

I _____, as a duly authorized agent
of _____ - (Contractor) have an agreement for construction
services on the above named project. The Contractor acknowledges having received at least one (1)
complete set of Contract Documents for the project and has posted all Addenda and all other contract
documents issued to date.

The Contractor is requesting the electronic CAD files of work prepared by the Architect and/or
Architect's Consultants (Design Team) on the subject project, so that the information therein may be
utilized in the Contractor's work on the same project. The Contractor understands that these files are
being provided as a courtesy and they are strictly intended for the Contractor's sole convenience and they
are not recognized Contract Documents. This request is subject to the following conditions, which the
Contractor hereby agrees to abide by:

1. It is understood and agreed to that any files and/or documents provided are instruments of
professional service by the Design Team and are intended for one-time use solely in the
construction of this project. They are and shall remain the property of the Architect or the
Architect's Consultants, who is deemed to be the author of the drawings and data, and who shall
retain all common law, statutory law, and all other rights, including copyrights.
2. The Contractor shall indemnify and hold harmless, the Design Team, its officers, directors,
employees or subcontractors, to the fullest extent permitted by law, against all claims, liabilities,
losses, damages, and costs, including but not limited to attorney's fees and defense costs arising
out of or resulting from contractor's use of these electronic files, or in any way connected with the
modification, misinterpretation, misuse, or reuse by the Contractor or by others.
3. The Contractor agrees that by using these electronic files, the Contractor is in no way relieved of
the duty to fully comply with the Contract Documents, including and without limitation, the need
to check, confirm and coordinate all dimensions and other details, take field measurements, verify
field conditions and coordinate with all other contractors for the project.
4. It is agreed to that these electronic files are not Contract Documents. Differences may exist
between electronic files and corresponding hard-copy Contract documents. The Design Team
makes no representation regarding the accuracy or completeness of the electronic files provided
to the contractor. In the event that a conflict arises, the signed and sealed hard-copy Contract
Documents shall govern. Contractor is responsible for determining if any conflict exists.
5. The Contractor understands that the Design Team makes no representation as to the compatibility
of these files with Contractor's computer hardware or software. The Contractor understands that
the accuracy of the information is an artifact of the techniques used to generate it and is in no way

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intended to imply actual accuracy. It is also understood that the automated conversion of information and data from the system and format used by the Design Team to an alternate system or format cannot be accomplished without the possibility of introduction of inexactitudes, anomalies and errors.

6. Because information presented on the electronic files can be modified, unintentionally or otherwise, the Design Team reserves the right to edit the drawings to remove information deemed not necessary and/or remove all indications of ownership and/or involvement from each electronic display.
7. The Design Team will only furnish those drawings directly applicable to the shop drawings the contractor wishes to create. The Contractor understands that not all electronic files may be available at the Design Team's discretion.
8. The Contractor understands that the Architect's Consultants may have Additional Conditions for release of their electronic files or documents, and the Contractor hereby agree to abide by the Consultants conditions in addition to the stated conditions in this agreement. Additional Conditions (if any) are attached to this agreement.
9. The Contractor understands that the Architect and the Architect's Consultants will incur certain costs in providing the requested electronic files. The Contractor agrees to pay the Design Team a service fee of \$120.00 per sheet, per delivery, prior to any delivery of the electronic files to compensate the Design Team for the labor to prepare and transmit the files and for the additional risk that this transfer will occasion.
10. Under no circumstances shall delivery of the electronic files for use by the Contractor be deemed a sale by the Owner, the Design Team, or any member of the Design Team. The Design Team makes no warranties, either expressed or implied, of merchantability or fitness for any particular purpose. In no event shall the Design Team be liable for any loss of profit or any consequential damages as a result of Contractor's use or reuse of the electronic files.

Darden Architects, Inc.

Description of the requested documents and/or CAD files:

___ Civil ___ Structural ___ Mechanical ___ Electrical ___ Other(s)

Printed Name

Title

Signed

Dated

SECTION 01 32 16 – CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Provide all material, labor, equipment and services necessary to completely provide Construction Schedules, Materials, accessories, and other related items necessary to complete the Project as indicated by the Contract Documents.
 - a. Provide an acceptable Critical Path Method (CPM) construction schedule and updating methods.
 - b. Use specific scheduling software.
 - c. Designate the Contractor's acceptable scheduling representative or utilize an acceptable scheduling consultant.
 - d. Prepare and submit a Preliminary Project Schedule (PPS).
 - e. Prepare and submit a CPM Baseline Project Schedule (BPS), and submit "cost-loaded" schedule data for the express use in the Monthly Progress.
 - f. Produce acceptable Monthly Schedule Updates (MSU), provide monthly schedule narrative reports, and attend monthly scheduling meetings.
 - g. Prepare Short Interval Schedules (SIS).
 - h. Prepare and submit Fragnet Submittals, when seeking time extensions, and/or float consumption.
 - i. Prepare acceptable recovery schedule(s) if the progress is unsatisfactory, and the requirement to gain acceptance from Architect for schedule revisions and sequence changes.
 - j. Schedule Inclement Weather impacts and resulting Mud impacts (if any) into the CPM Baseline Project Schedule (BPS), and for the requirement for time extension requests for unusually severe weather.
2. Provide projected Construction Schedule for entire Work and revise periodically.
3. Provide separate sub-schedule, showing all submittal information and the time frames in which they are to be submitted, that include the following:
 - a. Coordination Drawings.
 - b. Product Data.
 - c. Shop Drawings.
 - d. Samples.
 - e. Quality Assurance/Control Submittals.
 - f. Closeout Submittals.
4. Provide sub-schedules to define critical portions of entire schedule.

B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:

1. DIVISION 00 SPECIFICATION SECTIONS.
2. DIVISION 01 SPECIFICATION SECTIONS.
3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

A. The following definitions or terms apply to this specification section:

1. BPS Baseline Project Schedule.
2. CPM Critical Path Method.

- a. The longest continuous chain of activities through the schedule that establishes the minimum overall project duration.
- 3. "Activity": A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources, including manpower, equipment or materials. Work activities shall include, but not limited to, mobilization; submittals; Architect's review of submittals; procurement; delivery; installation and checkout of equipment or material; subcontractor's items of work and major construction activities.
 - a. Critical activities are activities on the critical path.
 - b. Predecessor activity is an activity that must be completed before a given activity can be started.
- 4. "Event": An event is the starting or ending point of an activity.
- 5. "Fragnet": A detailed proposed change in time based on an activity or activities, but do not show effect to the completion date.
- 6. "Milestone": A key or critical point in time for reference or measurement.
- 7. "Float":
 - a. Float for any activity, milestone completion date or contract completion date shall be considered a resource available to both the Owner and Contractor. Neither the Owner nor the Contractor shall have exclusive ownership of the float. Float shall be a resource to all parties, and shall be consumed by whoever utilizes it first.
- 8. "Inclement Weather":
 - a. "Inclement Weather" shall be considered as TEMPERATURE, PRECIPITATION (aka Rainfall & Rain Days) or FOG. The conditions for Inclement Weather are defined herein, and valuations of Inclement Weather are listed in the Meteorological Data NOAA Chart.
- 9. MSU Monthly Schedule Updates.
- 10. "Mud" (aka Mud Days):
 - a. Mud is a direct result of precipitation, and for this reason Mud is treated different than precipitation. Mud, or muddy site conditions, will become a candidate for time extensions, only if the amount of precipitation exceeds that which is anticipated and considered normal "Inclement Weather" for a given month.
- 11. NOAA National Oceanic and Atmospheric Administration.
- 12. NTP Notice to Proceed.
- 13. PDM Precedence Diagram Methodology.
- 14. PPS Preliminary Project Schedule.
- 15. SIS Short Interval Schedules.
- 16. "Unusually Severe Weather":
 - a. Defined as more severe than the anticipated "Inclement Weather" for any given month.

1.3 SUBMITTALS

A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:

- 1. Quality Assurance/Control Submittals:
 - a. Submit the Contractor's Construction Schedule and Submittal Sub-Schedule within 35 calendar days after the Award of Contract date, unless otherwise stated in the General Conditions.
 - b. Submit updated schedules as required by change in Work Progress.
- 2. All items listed below, unless otherwise indicated, shall be submitted in triplicate:
 - a. Within seven (7) days after the Award of Contract:

CONSTRUCTION SCHEDULES

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- 1) The Contractor shall provide evidence to demonstrate the competency in the use of CPM scheduling, including evidence of the use of cost-loaded Primavera CPM scheduling on projects of similar value and complexity. Upon failure of the Contractor to satisfy the Architect of its CPM scheduling competency, the Contractor shall be required to employ a qualified CPM schedule consultant who regularly performs these services and who in the opinion of the Architect possesses the capacity and qualifications required to perform CPM scheduling for this project.
- b. Within seven (7) days after the Notice to Proceed:
 - 1) Submit the Contractor's authorized representative and their qualifications.
- c. Within twenty-one (21) days after the Notice to Proceed:
 - 1) Submit Preliminary Project Schedule (PPS)
- d. Within sixty (60) days after the Notice to Proceed:
 - 1) Submit Baseline Project Schedule (BPS).
- e. Within seventy-five (75) days after the Notice to Proceed:
 - 1) Submit cost-loaded schedule data.
3. Coordination Schedules:
 - a. Contractor's Monthly Schedule Updates (MSU) as needed one week prior to progress payments.
 - b. Contractor's Short Interval Schedules (SIS) as needed at the regularly scheduled weekly meetings.
4. Contractor's Time Extension Requests / Fragnet Submittals:
 - a. "Notice of Delay" requests within twenty-four (24) hours after a delay event, on form provided at end of this section.
 - 1) Notice of Delay Form shall be accompanied by the required COR, CCD, RFP or other documents issued by the Architect.
 - b. Fragnet Submittal Forms (in quadruplicate) within fourteen (14) days after a delay event.
 - 1) Fragnet Submittal Forms shall be accompanied by the required COR, CCD, RFP or other documents issued by the Architect.
5. Submittal Sub-Schedule Submittal:
 - a. Submit the Submittal Sub-Schedule within 35 calendar days after the Award of Contract date, unless otherwise stated in the General Conditions.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. The Contractor shall designate, in writing, an authorized representative in its firm who shall be responsible for the preparation, revising, and updating of the cost-loaded Critical Path Method schedule (hereinafter referred to as CPM) utilizing Primavera scheduling software. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the construction scheduling requirements set forth herein. Such authority shall not be interrupted throughout the duration of the project. The requirements for the CPM schedule are included to assure adequate planning and execution of the work and to assist the Architect and Owner in appraising the reasonableness of the proposed schedule, evaluating progress of the work and for reviewing the Progress Payment Applications.
2. The Contractor must have scheduling capabilities (hardware and software, inclusive of plotter) located at the construction site, or readily accessible in a local area office. Any Consultant must have the capacity and capability of supporting the project by producing schedule-related data within two (2) days of request by the Contractor, Architect, or Owner.

B. Regulatory Requirements:

1. In accordance with Specification Section - REGULATORY REQUIREMENTS.

C. Meetings:

1. Progress Meetings: Scheduled by the Contractor on a weekly basis for the proper coordination of the work.
 - a. Minimum agenda shall be to review the work progress, and the following:
 - 1) Discuss field observations, problems, and decisions;
 - 2) Identification of any potential problems that may impede planned progress;
 - 3) Corrective measures to regain projected schedules;
 - 4) Maintenance of quality and work standards in accordance with manufacturer's warranty requirements.
2. Participants (or designated representative of) invited to attend each of the above meetings shall be as follows:
 - a. Contractor.
 - b. Owner.
 - c. Architect.
 - d. Project Inspector.
 - e. Installer.
 - f. Material Manufacturer(s).
 - g. Subcontractors, as appropriate (including any accessory subcontractors).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products specified are from companies listed below, or approved equivalent. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers listed as acceptable alternative manufacturers must still comply with the requirements of the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 1. Specified product manufacturer, or approved equivalent:
 - a. PRIMAVERA "Project Planner Version 3."
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Contractor's Construction Schedule Form:
 1. Prepare in form of horizontal bar chart.
 - a. Provide separate horizontal-box-column for each trade or operation.
 - b. Order: Chronological order of beginning of each item of Work.
 - c. Identify each column.
 - 1) By specification section number.
 - 2) By distinct graphic delineation.
 - d. Horizontal time scale: Identify first workday of each week.
 - e. Scale and spacing to allow space for updating.
 2. Sheet size and type: 24" x 36", transparency.
 3. Content of Contractor's Construction Schedule Form.
 - a. Provide complete sequence of construction by activity.
 - b. Identify Work of separate, logically grouped activities.
 4. Provide diskette copies of CPM Network, as required.
 5. Contractor shall use "Primavera" Project Planner Version P3 for Critical Path Method (CPM) Scheduling.

- a. The alternative is the means of providing Owner's Representative with files on CD's or DVD's (WINDOWS Formatted Disks) in a form that can be completely restored into "Primavera" without requiring the use of a Conversion Program or utilizing other software.
- B. Submittal Sub-Schedule Form:
 - 1. Prepare separate Submittal Sub-Schedule, as called for in Specification Section - SUBMITTAL PROCEDURES.

PART 3 - EXECUTION

3.1 SCHEDULES [AND PROCEDURES FOR CONSTRUCTION SCHEDULES]

- A. Architect will review schedules and return within 10 days after receipt.
 - 1. Resubmit within 7 days after return of review copy.
- B. Updating:
 - 1. As a condition of Application Payments (Progress Payments), the Contractor shall show all changes occurring since previous submission of updated schedules, or certify in writing that no changes have occurred. Failure to provide an updated schedule or certification could cause the Architect and Project Inspector to recommend that no payments by the Owner be made until the Contractor has complied with the conditions required for payments.
 - 2. Indicate progress of each activity and show completion dates.
- C. Distribution:
 - 1. Print copies of schedules for distribution.
 - 2. Distribute copies of reviewed schedules to:
 - a. Job site file.
 - b. Project Inspector.
 - c. Architect.
 - d. Sub-contractors.
 - e. Other concerned parties.
 - 3. Instruct recipients to report any inability to comply and provide detailed explanation with suggested remedies.
- D. General Requirements:
 - 1. The Architect considers the project schedule requirements to be of significant importance to both the Contractor and the Owner. The development, submittal, acceptance and maintenance of the Baseline Project Schedule (BPS) and subsequent Monthly Schedule Updates (MSU) must be given high priority.
 - 2. Work under this section shall consist of providing a computerized, time-scaled, cost-loaded Critical Path Method (CPM) Contract Schedule using Precedence Diagram Methodology (PDM) showing in detail how the Contractor plans to execute, coordinate and generate progress billings for the work.
 - 3. All schedule submittals (PPS, BPS, MSU's, Fragnets, schedule revisions and recovery schedules) shall include four (4) copies of the following:
 - a. An electronic copy of the schedule on CD (Compact Disc).
 - b. A time-scaled logic diagram or a time-scaled bar chart.
 - c. A tabular report that shows early start, early finish, late start, late finish, original duration, remaining duration, total float and percentage completion appropriately organized and sorted by building, site zones, and major activity codes.
 - d. A predecessor-successor tabular report organized by building, site zones, and major activity codes.

- e. A written narrative report describing the progress since last report, problems or delays experienced, mitigation undertaken, anticipated progress next month, and a listing of all submittals, RFIs, change directives, Owner-supplied equipment or other Owner-controlled and critical constraints affecting the Contractor's progress, or anticipated to become a critical constraint in the next month.
 - f. A listing of all significant changed, added or deleted activities, revised logic relationships, durations, descriptions, etc. (revisions for routine updates excluded).
 - g. Except for time extension requests, a cost report must be provided listing each activity and its associated cost, percentage of work accomplished, earned value to date, previous payments and amount earned for the update period. For all new or redefined activities created through updates, change orders, or for fragnet delay analyses for time extension requests, a cost report should also be provided listing each new or redefined activity and its associated cost.
 - h. A cash flow envelope report and cash flow projection diagram (S-curves) shall be submitted with the finalized, cost-loaded baseline project schedule. This report and diagram shall be based on the planned monthly progress billings expressed as a percentage of the total project cost. The report and diagram shall calculate and show two projections – one based on early starts/early finishes, and another based on late starts/late finishes. Monthly Schedule Updates (MSU) shall show actual billings plotted against early and late curves.
 - i. In addition, from month-to-month, the Architect may request the Contractor provide (at no cost) the following reports or schedule plots:
 - 1) Total or free float report from least to most float.
 - 2) Plots or reports of activities grouped by subcontractors, selected trades or buildings.
 - 3) Plots or reports of activities with scheduled early start in a given time frame (such as a 30- or 60-day look-ahead schedule).
 - 4) Subcontractor certifications, indicating approval of the subcontractors scheduled work, acknowledging outside factors such as manpower resources, stacking of trades, multiple mobilizations, coordination of space with other trades and the stacking of trades.
4. Contractor's Construction Schedule:
- a. The Contractor's Construction Schedule shall be the basis for evaluating the job progress and time extension requests. The responsibility for developing the construction schedule, accurately updating the schedule, and monitoring the actual progress of the work compared to the planned schedule rests solely with the Contractor.
 - 1) Failure of the Contractor to include any element of the work or any inaccuracy in the Contractor's Construction Schedule will not relieve Contractor from the responsibility for accomplishing all the work in accordance with the Contract requirements.
 - b. Progress payments may be withheld in whole or part should the Contractor fail to comply with the requirements of this section.
 - c. No separate payment will be made to the Contractor for any of the requirements of this section. All such costs shall be part of the Contractor's planned project overhead costs included in its bid.
- E. Early Completion Schedules:

1. Early completion schedules may be prohibited due to certain physical or monetary constraints imposed upon the Owner. If an early completion schedule is not prohibited, and is contemplated by the Contractor as part of its bidding strategy, it is hereby expressly understood by the Contractor that early completion schedules will only be acceptable under the condition that the schedule be reasonable and realistic, and if the Contractor certifies that it has included general conditions costs in its bid sufficient for the entire contractual time of performance. It is also understood, therefore, that no damages for delay will be recoverable if the project is prolonged beyond the early completion date, but still completed within the entire contract duration.
- F. Preliminary Project Schedule (PPS):
1. Contractor shall furnish the Architect with a PPS within twenty-one (21) days after receiving the Notice to Proceed.
 2. The PPS shall indicate a detailed plan for the work to be completed in the first ninety (90) days of the contract, including planned mobilization of plant and equipment; sequence of early operations; and procurement of materials and equipment. Work beyond first ninety (90) days shall be shown in a summary-level bar chart manner.
 - a. The PPS will be temporarily used to record and monitor the progress of the work until the Baseline Project Schedule has been completely developed and accepted. Recorded data on the Preliminary Project Schedule shall be incorporated into the Baseline Project Schedule during the first monthly update.
 3. Architect will review the PPS within seven (7) days for general conformance. Contractor shall incorporate any review comments into the preparation of the Baseline Project Schedule (BPS).
- G. Baseline Project Schedule (BPS):
1. Within sixty (60) days after the Notice to Proceed, Contractor shall submit a detailed BPS presenting an orderly and realistic plan for the completion of the entire project. The BPS shall be in full conformance with the requirements of this specification.
 - a. The project start date, completion date and the intermediate milestone dates shown in the BPS should match Contract requirements.
 2. Unless otherwise approved by the Architect, no activity on the BPS shall have a duration longer than fifteen (15) days, with the exception of submittal, approval, fabrication and delivery (procurement) activities. Activity durations shall be the total number of days required to perform that activity, including consideration for normal and anticipated weather-related impacts that might prolong performance of that activity. National Oceanic and Atmospheric Administration (NOAA) from the nearest observing site to the project shall be the contractual basis for determining "normal" weather or departures from normal.
 3. "Responsibility" codes shall be identified for each activity to indicate the responsible subcontractor. Other codes for "area," "trade" or "submittal/procurement" shall be similarly utilized to allow schedule data to be sorted and organized into separate, coherent reports or plots.
 4. The BPS shall include a separate sub-schedule for all submittal, approval and procurement activities, including owner-furnished items. Data shall include a particular specification reference, description of item of work covered, and a trade or subcontractor reference. Schedule activities that are dependent on submittal approval and/or material delivery shall not be scheduled to start earlier than the reasonably expected approval or delivery dates.
 - a. Coordinate Submittal Schedule with the list of subcontractors, Schedule of Values and the list of products as well as the Contract Construction Schedule.
 - b. Prepare the schedule in chronological order. Provide information as called for in specification section - SUBMITTAL PROCEDURES.
 - c. Distribution: Following the Architect's response to the initial submittal, print and distribute copies to the Architect, Owner, Subcontractors, and other parties required to comply with submittal dates indicated.

5. The BPS shall not show more than 10% of the total activities as critical. The BPS shall not show more than 20% of the activities with total float of 10 working days or less. The schedule shall not show any activities with negative float. Start and Finish constraints, unless identified in the contract documents, shall be minimized as much as possible to avoid logic conflicts.
 6. The BPS shall show the total cost of performing each activity. This cost shall be the total of labor, material and equipment, including general conditions, overhead and profit. The BPS shall not show a separate, individual activity for general conditions, overhead and profit. The cost of general conditions, overhead and profit shall be prorated to all cost-loaded activities. The sum of the cost for all activities shall equal the total contract value.
 7. The Contractor shall submit the proposed BPS, less cost-loaded data, within sixty (60) days after NTP. The Architect will commence a review to ascertain any lack of compliance with these specifications. Absent any notice from the Architect of such problems or compliance issues, the Contractor shall submit cost-loaded data within fifteen (15) days after the BPS was submitted, or within seventy-five (75) days of NTP.
 - a. The Architect will review the proposed BPS with cost loading for general conformance. Within thirty (30) days after the BPS is submitted, or fifteen (15) days after receipt of cost-loaded data, the Architect will accept the contract schedule or will return it with comments. If the proposed schedule is returned with comments, Contractor shall revise the schedule to incorporate the comments. The schedule shall be resubmitted for acceptance within seven (7) days. The accepted BPS shall become the Contract Construction Schedule.
- H. Monthly Schedule Updates (MSU):
1. The Contractor shall submit an MSU, each month, which accurately indicates the actual progress of the work during the prior month. The "data date" (or date through which progress is reported) shall be identified on all update reports or schedule plots. For cost-loaded schedules, the data date shall be the progress billing cut-off date (typically the 25th of the month). Schedule updates shall be submitted within five (5) days after the Architect approves the billing percentages.
 - a. The MSU shall indicate the actual start and finish dates of activities commenced or completed during the prior month. Once "as-built" start and finish dates are updated and accepted as accurate, this data shall not be changed. The MSU shall show the percentage complete for each activity.
 2. Schedule calculations shall be performed as follows. If the Contractor has proceeded out-of-sequence from the planned logic, the Contractors monthly update shall use the "retained logic" option to perform schedule calculations. Also, when the duration(s) of schedule activities are calculated, the "contiguous duration" option shall be used. Interruptible durations are not acceptable.
 3. The Contractor shall submit a narrative report along with the MSU. This narrative report shall include a description of the progress achieved that month, a description of problems or delays experienced, an analysis of the effect of approved time extensions to critical activities upon the project completion date, a discussion of current or anticipated delays, and if there is a lack of progress for which the Contractor is responsible, an explanation of mitigating actions taken or a proposal for recovery shall be provided. Further, if the schedule data is changed due to a routine updating only, no identification or discussion of such changes is required in the Monthly Schedule Update. However, if the work is re-sequenced, or if activities are added or deleted, these schedule data changes must be specifically identified, discussed and submitted. Specifically, such submittals shall be separate and apart from monthly update submittals.

4. As part of the MSU, and as part of the Architect's review of the Contractor's progress that month, a monthly schedule meeting shall be held. The monthly meeting shall be held on a mutually agreed date, but no later than ten (10) days after the submittal of the MSU. The Contractor's designated schedule representative shall attend. The intent of these monthly meetings is to address and resolve all schedule issues for the prior month. The Architect requires the MSU no later than seven (7) days prior to the monthly schedule meeting. The Architect may waive or postpone the monthly meeting(s).
 5. The Architect will review the Contractor's MSU submittal. Any of the Architect's comments shall be incorporated into the next update for the Architect's verification.
- I. Sequence Changes / Recovery Schedules / Schedule Revisions:
1. If the Architect determines that the sequence of the construction differs significantly from the Contract schedule, the Contractor shall submit a revised schedule for approval within fifteen (15) days of the Architect's request. The Contractor agrees to be bound by the Contractor's revised, re-sequenced or optimized schedules, and agrees to make no claim for such.
 2. If a Contractor falls fourteen (14) days behind schedule on milestone dates or completion dates, the Contractor will be required to prepare and submit a recovery schedule for review and acceptance. The recovery schedule shall show how the Contractor intends to reschedule the work in order to regain the time lost.
 3. If the Contractor intends to alter its planned sequence or approach to the work, the Contractor shall submit its requested schedule revisions or sequence changes to the Architect for review and comment. This submittal shall be separate from the routine MSU, and shall include a description of the reason(s) for the schedule changes, a description of the changes being made, a list of all added and deleted activities, changed logic relationships, changed activity durations or descriptions, etc. If the requested changes are reviewed and found acceptable, the schedule revision shall be made and incorporated into the project schedule prior to the next MSU.
- J. Short Interval Schedules (SIS):
1. At the regularly scheduled weekly meetings, the Contractor shall submit to the Architect and District a SIS, which is a three-week-look-ahead schedule. The SIS shall be a three-week snapshot of the work generated from the most recent monthly update. The SIS shall include the prior week, the current week, and one week thereafter. The SIS shall contain sufficient detail to evaluate inspection requirements, and for the Contractor to submit its manpower and equipment needs.
- K. Time Extension Requests / Fragnet Submittals:
1. The Contractor shall provide "Notice of Delay" and a Fragnet Submittal to the Architect for all claimed time extension requests, showing the impact of the delay event on the contract schedule. The Notice of Delay form and Fragnet Submittal form is included at the end of this specification section.
 2. The Fragnet Submittal shall demonstrate the time impact based on the date(s) and durations of the delay event, the status of construction at that point in time, and the affect on the scheduled sequence and progress of the work. The Fragnet Submittal shall be based on the latest Monthly Schedule Update. The Fragnet Submittal shall also include all supporting project documentation or delay calculations that establish entitlement and quantify the delay. All required documentation shall have the Fragnet Submittal number posted in the upper-right hand corner of the page.
 3. "Float" on slack time shall not be for the exclusive use or benefit of the Contractor or Owner. Extensions of time for performance will be granted only to the extent that the equitable time adjustment for the activity or activities affected exceeds the total float along the activity path at the time the delay event occurred or when an instrument of the Contract (CCD) or change order was directed.

4. The Contractor acknowledges and agrees that mitigation of delays due to delay events may require a change to preferential sequences of work. The Contractor must propose possible mitigation plans (sequence changes and any costs) for otherwise critical path delays. The Architect will evaluate the cost of mitigation versus the cost of extended project performance. The Contractor agrees to be bound by the Contractor's revised, re-sequenced or optimized schedules, and agrees to make no claim for such.
 5. Fragnet Submittals shall be provided in quadruplicate and within fourteen (14) days after a delay event, and/or with a Change Order Request (COR) in response to a CCD, RFP, or other documents issued by the Architect. In cases where the Contractor does not provide "Notice of Delay" and/or a Fragnet Submittal for a delay event within the specified time limits, then it is mutually agreed that the delay event has no time impact on the contract completion date (or interim milestones) and no time extension is required.
 6. The Owner (or District) shall not be liable for any acceleration costs due to the Contractor's failure to comply with the contract requirements for requesting, documenting and demonstrating that a time extension is required for a delay event. The Contractor's obligation to timely perform per the schedule will not be excused until time extension requests are approved by the Architect. The BPS shall include delays for anticipated precipitation. Hence the duration for activities will not be adjusted, that is until the actual amount of precipitation days exceed the anticipated precipitation days indicated in the NOAA chart, and/or the resulting mud impacts affect the critical path of the schedule.
 7. Upon mutual agreement by the Architect and Contractor, the Monthly Schedule Updates shall include the approved time extensions (if any). No delay events that are the subject of a float consumption request or a time extension request will be incorporated into the Monthly Schedule Update until approved by the Architect.
 8. In the event of multiple delaying events, and upon approval through the time extension approval process, the delay events shall be updated into the current Monthly Schedule Update in the actual order of the delaying events.
- L. Time Extensions For Unusually Severe Weather:
1. General:
 - a. "Inclement Weather": The Owner reserves the right to update Meteorological Data included in the NOAA Chart, so that it reflects the most accurate data for the project site, site conditions and locality.
 - b. "Unusually Severe Weather" is more severe than the anticipated Inclement Weather for any given month.
 - c. NOAA, is the National Oceanic and Atmospheric Administration
 - d. "Mud" (aka Mud Days) shall be considered as muddy site conditions, which prohibit access to and around the project site, including access to the buildings. The Contractor shall understand that even if the anticipated normal precipitation were exceeded for a given month, not all Mud Days are eligible for time extensions. Only a portion of the actual Mud Days will be considered for a time extension, of which they will be the percentage of actual precipitation that are above and beyond the anticipated normal precipitation or "Inclement Weather": See "Unusually Severe Weather". Also, precipitation and Mud need to affect the activities on the critical path in order for them to impact the project schedule. If precipitation and Mud do not affect the critical path of the project, there is no effect to the project and such conditions are not eligible for time extensions. Differing site soil conditions and drainage patterns will create individual variations in how "Mud" affects the site and the progress of the Work. It is the Contractors obligation to become aware of the site soil conditions, drainage patterns, and other elements that may affect the resulting impacts due to Mud.

2. The provisions herein specify the procedures for the determination of excusable time extensions for unusually severe weather. Inclement Weather, using the NOAA data (to be provided by the Contractor prior to first payment request and approved by the Architect - "sample" NORMALS, MEANS AND EXTREMES data chart provided herein) and resulting Mud impacts due to anticipated precipitation, shall be scheduled into the schedule. In order for the Architect to award a time extension under this clause, the Contractor must satisfy the following conditions:
 - a. The Unusual Weather clause experienced at the project site during the affected contract period must be found to be Unusually Severe Weather, that is, more severe than the anticipated Inclement Weather and Mud for any given month.
 - b. The Unusually Severe Weather clause must actually cause a delay to the completion of the Contract. The delay must be beyond the control and without the fault of negligence of the Contractor.
3. The following "sample" schedule of anticipated monthly Inclement Weather is based on National Oceanic and Atmospheric Administration (NOAA) data for the Fresno Area and the schedule provided by the Contractor for the area where the project is located shall constitute the baseline for evaluating weather-related time extensions. The Contractor progress schedule must include the effect of anticipated Inclement Weather and Mud in all weather dependent activities. Further, the Contractor's bid shall include all costs for potential disruption as a result of anticipated Inclement Weather and Mud: Disruption to the project may involve cost and time impacts. The Contractor shall be responsible for all impacts resulting from the anticipated amount of Mud and Inclement Weather shown in the actual NOAA Meteorological Data Chart in the area where the project is located. Impacts include, but are not limited to, de-watering, mucking, temporary weather protection, gravel roadways, equipment downtime, etc.
4. Upon Notice-to-Proceed (NTP) and continuing through the Contract duration, the Contractor shall record on the Contractor Daily Reports, each occurrence of Inclement Weather and Mud, and the resulting impact to the progress of scheduled work. Each occurrence of Inclement Weather and Mud, must be verified and approved by the Inspector of Record. Inclement Weather days will be as defined by the following "sample" NOAA data and will be counted chronologically from the first to the last day of each month, with each daily incidence of "Inclement Weather" being counted as a whole day. Once the number of days of anticipated "Inclement Weather" and "Mud" are exceeded in a given month, the Contractor will become eligible for an excusable, non-compensable time extension for "Unusually Severe Weather." After anticipated "Inclement Weather" and "Mud" delays are exceeded, an "Unusually Severe Weather" delay day will occur when adverse weather prevents work on critical activities for more than fifty percent (50%) of the Contractor's scheduled work day. Upon experiencing critical path delays due to "Unusually Severe Weather," the Contractor shall seek a time extension from the Architect via the Change Order Request process. If the foregoing conditions are met, an excusable a non-compensable time extension will be granted. The Contractor will incorporate all approved Change order Request Submittals into the current Monthly Schedule Update.

- THE REST OF THIS PAGE IS INTENTIONAL BLANK -

M. Meteorological Data Chart 1

EXAMPLE □ Meteorological Data for Fresno, California Normals, Means and Extremes							
TEMPERATURE (degrees F)					PRECIPITATION***		FOG
	Normal		Extremes				
Month	Daily Max.	Daily Min.	Record Highest	Record Lowest	Mean* Number Calendar / Work	Normal (in)	Mean** Number Calendar / Work

CONSTRUCTION SCHEDULES

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					Days per Month		Days per Month
Jan	54.1	37.4	78	19	7.5/5.4	1.96	11.8/8.4
Feb	61.7	40.5	80	24	7.1/5.1	1.8	6.0/4.3
Mar	66.6	43.4	90	26	7.1/5.1	1.89	1.7/1.2
Apr	75.1	47.3	100	32	4.1/2.9	0.97	0.3/0.2
May	84.2	53.7	107	36	1.9/1.4	0.3	0.1/0.1
Jun	92.7	60.4	110	44	0.7/0.5	0.08	0.0/0.0
Jul	98.6	65.1	112	50	0.2/0.1	0.01	0.0/0.0
Aug	96.7	63.8	111	49	0.3/0.2	0.03	0.1/0.1
Sep	90.1	58.8	111	37	1.0/0.7	0.24	0.1/0.1
Oct	79.7	50.7	102	27	2.2/1.6	0.53	0.9/0.6
Nov	64.7	42.5	89	26	5.2/3.7	1.37	5.8/4.1
Dec	53.7	37.1	76	18	6.7/4.8	1.42	12.1/8.6
Year					44.1/31.5	10.6	38.8/27.7
Source: NOAA, National Oceanic and Atmosphere Administration.							
* Precipitation of 0.01 inches or more.							
** Heavy Fog visibility 1/4 mile or less.							
*** Refer to the term Mud, for mud impacts.							
Above data is subject to change, based upon the locality of the project. Contractor shall assemble the data and submit to The Architect for confirmation, review and modifications: Obtain data from NOAA (828) 271-4800, or the Local Weather Office. http://www.ncdc.noaa.gov							

FRAGNET SUBMITTAL FORM

Date: _____ Fragnet No.: _____
 From: Name of Contractor Sheet _____ of _____
 To: Darden Architects, 6790 N. West Avenue, Fresno, CA 93711 (559) 448-8051

Description of Delay: By reference to attached schedule Fragnet, the following delay occurred:

Continued on Sheets ____ of ____
 Time Extension Requested: _____ work days x 1.4 = _____ calendar days.
 Time Requested for Activity: _____ Time Requested for Project: _____
 Related Documents: The following construction documents provide evidence of the delay event:
 RFI Nos.: _____ SI Nos.: _____
 CCD Nos.: _____ RFP Nos.: _____
 Daily Reports Dated: _____ and attached.
 Project Correspondence Dated: _____ and attached.
 Other Documentation: _____

Schedule-Related Information: By reference to the attached Fragnet, provide the following:

Predecessor Activity to Fragnet: _____
 Successor Activity to Fragnet: _____

Affected CPM Schedule Activities (list IDs and descriptions):

NOTICE OF DELAY FORM

Date: _____

From: Name of Contractor Sheet _____ of _____

To: Darden Architects, 6790 N. West Avenue, Fresno, CA 93711 (559) 448-8051

Description of Delay: the following delay occurred:

_____ Continued on Sheets ____ of ____

Related Documents: The following construction documents provide evidence of the delay event:

RFI Nos.: _____ SI Nos.: _____

CCD Nos.: _____ RFP Nos.: _____

Daily Reports Dated: _____ and attached.

Project Correspondence Dated: _____ and attached.

Other Documentation: _____

Affected CPM Schedule Activities (list IDs and descriptions):

END OF SECTION

SECTION 01 32 26 – FORMS AND REPORTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Contractor to provide all Forms and Reports as required by the Architect for Administrative Procedures and other related items necessary to document the Project as required by the Contract Documents, including but not limited to those forms provided under this specification section.
 - 2. CalGREEN Forms:
 - a. Contractor shall provide all California Green Building Standards Code Certification Worksheets and other related items necessary to document the Project as required by the AHJ, including, but not limited to, those forms provided under this specification section.
 - 1) Obtain the latest documents from the California Building Standards Commission; revisions may have been made since the publication of this Project Manual.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS
 - 2. DIVISION 01 SPECIFICATION SECTIONS
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP

1.2 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Forms and Reports as attached to this section when required by the Architect.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 SCHEDULES

- A. Listing of Architect required Forms and Reports
 - 1. 01 32 26.01-DAILY SUPERINTENDENT'S REPORT
 - 2. 01 32 26.02-SUBCONTRACTOR'S DAILY REPORT
 - 3. 01 32 26.03-SHOP DRAWING AND SUBMITTAL TRANSMITTAL
 - 4. 01 32 26.04-REQUEST FOR INFORMATION (RFI)
 - 5. 01 32 26.05-SUPPLEMENTAL INSTRUCTIONS (SI)

FORMS AND REPORTS

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6. 01 32 26.06-REQUEST FOR PROPOSAL (RFP)
 7. 01 32 26.07-CONSTRUCTION CHANGE DIRECTIVE (CCD)
 8. 01 32 26.08-CHANGE ORDER REQUEST REVIEW (COR)
 - a. (Review form provided by the Contractor is subject to review and comments by the Owner and Architect).
 9. 01 32 26.09-CHANGE ORDER (CO)
 10. 01 32 26.10-FRAGNET SUBMITTAL FORM
 11. 01 32 26.11-APPLICATION FOR PAYMENT (AP)
 12. 01 32 26.12-CONTRACTOR'S TESTING / INSPECTION REQUEST FORM
 13. 01 32 26.13-CONTRACTOR'S "DEVIATION NOTICE" INSPECTION REPORT FORM
 14. 01 32 26.14-CONTRACTOR'S FINAL INSPECTION REQUEST FORM
 15. 01 32 26.15-CONTRACTOR'S PUNCHLIST INSPECTION REQUEST FORM
 16. 01 32 26.16-CONTRACTOR'S PUNCHLIST
 17. Periodic field reports issued by the Architect and Engineers.
 18. Contractor's Punch List Response and Correction form is required for each Punch List Review report, citing the issuing Punch List Review format number(s).
 19. Completed Contractor's Punch List and Final Inspection Reports issued by the Architect, Engineers and the Owner.
 20. See the attached Forms and Reports suitable for reproduction by the Contractor or Subcontractor.
- B. Listing of California Green Building Standards Code Certification Worksheets:
1. WORKSHEET (WS-1) BASELINE WATER USE
 2. WORKSHEET (WS-2) WATER USE REDUCTION
 3. CONSTRUCTION WASTE MANAGEMENT (CWM) PLAN
 4. CONSTRUCTION WASTE MANAGEMENT (CWM) WORKSHEET
 5. CONSTRUCTION WASTE MANAGEMENT (CWM) ACKNOWLEDGMENT

END OF SECTION

**GENERAL CONTRACTOR'S
DAILY SUPERINTENDENT'S REPORT**

(JOB NO./REPORT NO.)

(DATE/DAY)

(JOB NAME)

WEATHER DESCRIPTION

(WORK SHIFT) / FROM / TO

(PROJECT MANAGER/SUPERINTENDENT)

PM/ SUPT	ENGR/ TK	CARPENTERS			LABORERS		CEM FINISHERS			OPER ENGR		OTHER	TOTAL
		FMAN	JRMAN	APP	FMAN	LAB	FMAN	JRMAN	APP	JRMAN	APP		

CONCRETE: CY TODAY: LOCATION: CY TO DATE:

WORK SUMMARY:

DELAYS / WORK RELEASED BY OWNER:

CHANGE ORDERS / EXTRA WORK ORDERS:

INSTRUCTIONS FROM ARCHITECT / OWNER:

MATERIALS / EQUIP. DELIVERED TO JOB:

INSPECTIONS / TESTS PERFORMED

SAFETY / ACCIDENTS:

MAJOR EQUIP. ON SITE:

BACKSIDE OF GENERAL CONTRACTOR'S REPORT

[illegible]

MAJOR EQUIPMENT ON SITE:

BACK CHARGES:

REMARKS:

**SUBCONTRACTOR'S
DAILY REPORT**

PROJECT:

DATE:

SHIFT TIME

FOREMAN:

WEATHER:

WORK DESCRIPTION AND LOCATION:

SUB-SUBCONTRACTOR	CREW SIZE	CRAFT	WORK DESCRIPTION / LOCATION

DELAYS:

CHANGE ORDERS / EXTRA WORK ORDERS:

INSTRUCTIONS RECEIVED FROM GC:

TESTS / INSPECTIONS PERFORMED:

MATERIAL / EQUIPMENT DELIVERIES:

MAJOR EQUIPMENT ON SITE:

SAFETY / ACCIDENTS:

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SHOP DRAWING AND SUBMITTAL TRANSMITTAL

DESCRIPTION:

SUBMITTAL NO.:

SPEC SECTION:

ARCHITECT:

Darden Architects

6790 N. West Ave

Fresno, California 93711

PROJECT:

CONTRACTOR:

SUPPLIER:

Substitution: Yes: ☐ DSA Approval Req'd

DATE RECEIVED: _____ **NO. RECEIVED:** _____ **DATE RETURNED:** _____

Contractor Remarks:

Other Required Information:

CPM Activity / Submittal Task No.: _____

Early Start (ES) Date: _____

Late Finish (LF) Date: _____

WARRANTY: ☐ O and M MANUALS ☐

Early Finish (EF) Date: _____

Scheduled Float Time: _____ 0

DESIGN CONSULTANT'S REVIEW:

TRANSMITTED BY ARCHITECT TO: _____ DATE RETURNED: _____

DATE SENT: _____

NO. SENT: _____

Consultants Remarks:

ACTION:

- ☐ NO EXCEPTION TAKEN RELATIVE TO DESIGN
- ☐ NO EXCEPTION TAKEN WITH MODIFICATION NOTED
- ☐ AMEND AS NOTED AND RESUBMIT
- ☐ REJECTED AND RESUBMIT
- ☐ SEE ATTACHED LETTER

ARCHITECT'S REVIEW:

Architects Remarks:

ACTION:

- ☐ NO EXCEPTION TAKEN RELATIVE TO DESIGN
- ☐ NO EXCEPTION TAKEN WITH MODIFICATION NOTED
- ☐ AMEND AS NOTED AND RESUBMIT
- ☐ REJECTED AND RESUBMIT

Approved Substitution ☐

COPIES TO:

DATE RETURNED: _____

Contractor:

Owner:

Inspector:

File:

Other:

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6790 N. West Avenue
Fresno, California 93711
Tel: 559.448.8051
Fax: 559.446.1765

www.dardenarchitects.com

REQUEST FOR INFORMATION

RFI No.:

To: **Darden Architects**
6790 N. West Ave
Fresno, California 93711

Date:
Respond By:

Attn:

Architect Project No.
Project:

DSA/HCAI Review
Required

Yes No Apprd
☐ ☐ ☐

INFORMATION REQUESTED:

Cost Impact: _____ Signature: _____
Schedule Impact: _____ Days Pages Attached: _____
Trade/Contractor: _____ Schedule Task No/Item: _____

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in the Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgement that there will be no change in the Contract Sum or Contract Time.

If the Contractor considers that this supplemental instruction requires a change in the Contract Sum or Contract Time, the Contractor shall not proceed with this Work and shall promptly submit an itemized proposal to the Architect for doing this work. If your proposal is found to be satisfactory and in order, this supplemental instruction will be superseded by a Construction Change Directive.

Referred To: _____ Referred Date: _____ Return Date: _____

SUPPLEMENTAL INSTRUCTIONS:

Consultant : _____

Architect _____

Date: _____

Date _____

Copy: ☐ Owner ☐ Inspector ☐ Testing Lab ☐ Structural ☐ Mech. ☐ Elec ☐ File ☐ Other Pages Attached: _____

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6790 N. West Avenue
Fresno, California 93711
Tel: 559.448.8051
Fax: 559.446.1765

www.dardenarchitects.com

SUPPLEMENTAL INSTRUCTIONS

PROJECT:

SUPPL. INST. NO.:

DATE OF ISSUANCE:

OWNER:

CONTRACT DATE:

CONTRACTOR:

NOTICE TO PROCEED:

Architect Project No.:
DSA Appl. No.:
DSA File No.:
OPSC Appl. No.:
HCAI No.:

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in the Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgement that there will be no change in the Contract Sum or Contract Time.

If the Contractor considers that this supplemental instruction requires a change in the Contract Sum or Contract Time, the Contractor shall not proceed with this Work and shall promptly submit an itemized proposal to the Architect for doing this work. If your proposal is found to be satisfactory and in order, this supplemental instruction will be superseded by a Construction Change Directive.

Description:

Trade/Contractor:

Schedule Task No/Item:

Attachments:

Darden Architects, Inc.

Issued By:

Architect

☐ OWNER ☐ CONTRACTOR ☐ INSPECTOR ☐ TESTING LAB ☐ STRUCTURAL ☐ MECHANICAL ☐ ELECTRICAL ☐ OTHER

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REQUEST FOR PROPOSAL

PROJECT:

REQUEST FOR PROPOSAL NO.:

DATE OF ISSUANCE:

OWNER:

CONTRACT DATE:

NOTICE TO PROCEED:

CONTRACTOR:

Architect Project No.:

DSA Appl. No.:

DSA File No.:

OPSC Appl. No.:

HCAI No.:

Please submit an itemized proposal for change in the Contract Sum and Contract Time for proposed modifications to the Contract Documents described herein. Submit proposal promptly or notify the Architect in writing of the date on which you anticipate submitting your proposal.

This is not a Change Order, Construction Change Directive, or a direction to proceed with the Work described in the proposed modifications.

Description:

Attachments

Darden Architects, Inc.

ISSUED BY:

Architect

☐ OWNER ☐ CONTRACTOR ☐ ARCHITECT ☐ CONSULTANT ☐ INSPECTOR ☐ OTHER

INTENTIONALLY LEFT BLANK

CONSTRUCTION CHANGE DIRECTIVE

PROJECT:

DIRECTIVE NO.:

DATE OF ISSUANCE:

OWNER:

CONTRACT DATE:

NOTICE TO PROCEED:

CONTRACTOR:

Architect Project No.:
DSA Appl. No.:
DSA File No.:
OPSC Appl. No.:
HCAI No.:

You are hereby directed to make the following change(s) in this Contract:

CONTRACT ADJUSTMENT

1. The proposed basis of adjustment to the Contract Sum or Guaranteed Maximum Price is:

- ☐ Lump Sum
☐ Unit Price of
☐ As provided for in General Conditions and the Supplemental Conditions of the contract.
☐ As Follows:

2. The Contract Time is proposed to (be adjusted) . The proposed adjustment, if any, is increase of _____ days)

When signed by the Owner and Architect and received by the Contractor, this document becomes effective IMMEDIATELY as a Construction Change Directive (CCD), and the Contractor shall proceed with the change(s) described above.

Signature by the Contractor indicates the Contractor's agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this Construction Change Directive.

ARCHITECT

OWNER

CONTRACTOR

Darden Architects

6790 N. West Ave

Fresno, California 93711

By:

By:

By:

Date:

Date:

Date:

☐ OWNER

☐ CONTRACTOR

☐ ARCHITECT

☐ CONSULTANT

☐ INSPECTOR

☐ OTHER

INTENTIONALLY LEFT BLANK



6790 N. West Ave

Fresno, California 93711

Tel: 559.448.8051

Fax: 559.446.1765

www.dardenarchitects.com

CHANGE ORDER REQUEST REVIEW

PROJECT:

CHANGE ORDER REQUEST NO.:

DATE OF ISSUANCE:

OWNER:

Architect Project No.:

DSA Appl. No.:

DSA File No.:

OPSC Appl. No.:

HCAI No.:

CONTRACTOR:

DESCRIPTION OF PROPOSED CHANGE:

Requested By:

Scope:

Necessary for:

DESIGN CONSULTANT'S REVIEW:

Date Sent:

ACTION:

Referred To:

Date Returned:

- ☐ NO EXCEPTION TAKEN RELATIVE TO COST
☐ NO EXCEPTION TAKEN RELATIVE TO TIME
☐ AMEND AS NOTED AND RESUBMIT
☐ REJECTED

Consultants Remarks

ARCHITECT'S REVIEW:

Date Returned:

ACTION:

Architects Remarks:

- ☐ NO EXCEPTION TAKEN RELATIVE TO COST
☐ NO EXCEPTION TAKEN RELATIVE TO TIME
☐ AMEND AS NOTED AND RESUBMIT
☐ REJECTED

Attachments:

REVIEWED:

Darden Architects
6790 N. West Ave
Fresno, California 93711

APPROVED:

Darden Architects :

Date :

Owner :

Date :

The Architect is hereby directed to instruct the Contractor to make the above changes in the Project and to include these changes in a subsequent Change Order:

☐ OWNER ☐ CONTRACTOR ☐ INSPECTOR ☐ STRUCTURAL ☐ MECHANICAL ☐ ELECTRICAL ☐ OTHER

CHANGE ORDER REQUEST NO.

Project Architect's Project No.:

CHANGE ORDER REQUEST- BREAKDOWN WORKSHEET

WORK DELETED:

Contractor			
Materials	\$0.00		
Equipment	\$0.00		
Labor	\$0.00		
Material, Equipment, & Labor	\$0.00		
TOTAL:			\$0.00

ADDITIONAL WORK PERFORMED BY SUB-CONTRACTOR

Sub-Contractor			
Materials	\$0.00		
Equipment	\$0.00		
Labor	\$0.00		
Material, Equipment, & Labor	\$0.00		
Overhead	\$0.00		
Profit	\$0.00		
Sub Total:		\$0.00	
Contractor			
Overhead		\$0.00	
Profit		\$0.00	
TOTAL:			\$0.00

ADDITIONAL WORK PERFORMED BY CONTRACTOR

Contractor			
Materials	\$0.00		
Equipment	\$0.00		
Labor	\$0.00		
Material, Equipment, & Labor	\$0.00		
Overhead	\$0.00		
Profit	\$0.00		
TOTAL:			\$0.00

TOTAL COST:	\$0.00
--------------------	---------------

TOTAL COST:	\$0.00
-------------	--------

TOTAL DAYS:	0
-------------	---

ARCHITECTURAL ADMINISTRATIVE FEES:

Proposal Request Administration	\$0.00
Construction Administration	\$0.00
TOTAL:	\$0.00
DSA Fees:	\$0.00

CHANGE ORDER

PROJECT:

CHANGE ORDER NO.:

DATE OF ISSUANCE:

OWNER:

CONTRACT DATE:

CONTRACTOR:

NOTICE TO PROCEED:

Architect Project No.:
DSA Appl. No.:
DSA File No.:
OPSC Appl. No.:
HCAI No.:

The Contract is changed as follows:

Description:

It is mutually agreed that the affixed signature to this Change Order is evidence that all compensation with respects to the changes defined herein have been satisfied with the execution of this document. Furthermore, no additional compensation either monetarily or via time extension to this contract will be sought in respect to this Change Order.

The Original Contract Sum and Contract Completion Date:

Net change (Contract Sum and Contract Time) by previous Change Orders: _____ days

Contract Sum and Contract Completion Date prior to this Change Order: _____

Contract Sum and Contract Time (increased or decreased) by this Change Order: _____ days

New Contract Sum and Contract Completion Date including this Change Order: _____

CONTRACTOR

ARCHITECT

OWNER

Darden Architects
6790 N. West Ave
Fresno, California 93711

By: _____

By: _____

By: _____

Date: _____

Date: _____

Date: _____

☐ OWNER ☐ CONTRACTOR ☐ ARCHITECT ☐ CONSULTANT ☐ INSPECTOR ☐ OTHER

INTENTIONALLY LEFT BLANK

FRAGNET SUBMITTAL FORM

Date: _____ Sheet _____ of _____

From: _____ Fragnet No.: _____

To: Darden Architects, Inc.

Description of Delay: By reference to attached schedule fragnet, the following delay occurred:

Continued on Sheets _____ of _____
Time Extension Requested: _____ wds, _____ cds.
Time Requested for Activity: _____ Time Requested for Project: _____

Related Documents: The following construction documents provide evidence of the delay event:

RFI Nos.: _____ SI Nos.: _____

CCD Nos: _____ RFP Nos.: _____

Daily Reports Dated: _____ and attached.

Project Correspondence Dated: _____ and attached.

Other Documentation: _____

Schedule-Related Information: By reference to the attached fragnet, provide the following:

Predecessor Activity to Fragnet:

Successor Activity to Fragnet:

Affected CPM Schedule Activities (list IDs and descriptions):

New CPM Schedule Activities (list IDs and descriptions):

END OF FORM

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APPLICATION FOR PAYMENT

To:
DARDEN ARCHITECTS, INC.
6790 N. West Avenue
Fresno, CA 93711

Project: _____

Pay Application No.: _____

Distribution to:

Owner: _____

Bid Package No. _____

Application Date: _____

Architect: _____

FROM _____

Period Ending: _____

Contractor: _____

Const Mgr.: _____

Inspector: _____

Prime Contractor

Address: _____

Phone: _____

CONTRACTOR'S APPLICATION FOR PAYMENT**CHANGE ORDER SUMMARY****APPROVED CHANGE ORDERS:**

Change Order No.:	Approved Date:	Amount:
		\$
		\$
		\$
		\$
		\$
		\$
		\$
		\$
		\$

TOTALS

Net change by Change Order	\$
----------------------------	----

The undersigned Contractor certifies that in the best of his knowledge, information, and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the contractor for work for which previous Certificates for Payment were issued and payment received from the Owner and that current payment show herein is now due.

Contractor: _____

DATE: _____

The present status of the account for this Contract is as follows:

ORIGINAL CONTRACT SUM \$ _____

Net Change by Change Orders \$ _____

CONTRACT SUM TO DATE: \$ _____

TOTAL COMPLETE & STORED TO DATE: \$ _____

RETAINAGE: _____ %: \$ _____

TOTAL EARNED LESS RETAINAGE: \$ _____

LESS STOP NOTICE(S): \$ _____

LESS PREVIOUS PAYMENT: \$ _____

CURRENT PAYMENT DUE: \$ _____

This Certificate is not negotiable. This AMOUNT CERTIFIED is payable only to the Contractor named herein, issuance, payment and acceptance of payment, are without prejudice to any rights of the Owner or Contractor under this contract.

CONTRACTOR: _____

DATE: _____

CONSTRUCTION MANAGER: _____

DATE: _____

INSPECTOR: _____

DATE: _____

ARCHITECT: _____

DATE: _____

INTENTIONALLY LEFT BLANK

CONTRACTOR'S TESTING / INSPECTION REQUEST FORM

PROJECT: _____
DATE RECEIVED: _____ (by Inspector)
TIME RECEIVED: _____ (by Inspector)

BUILDING: _____
SITE/OFFSITE: _____
CONSTRUCTION PHASE (1, 2, 3, etc.): _____
SPECIFICATION SECTION (No.): _____
PLAN SHEET AND DETAIL: _____
SCOPE OF WORK: _____
(concrete, electrical, etc.)

INSPECTION REQUESTED BY: _____
(contractor name)

LOCATION (bldg., room, floor, wall, ceiling, etc.) _____

TYPE OF INSPECTION (concrete, framing, welding, masonry, electrical, etc.) _____

INSPECTION REQUESTED ON: _____ at _____ am/pm
(date) (time)

Note 1: A Minimum Notice of 48 hours is Required to be Received by the Inspection Officer Prior to the Time the Testing / Inspection is Requested to Begin.

PRINT NAME AND TITLE OF PERSON REQUESTING INSPECTION

SIGNATURE OF PERSON REQUESTING INSPECTION

Note 2: Contractor Must Accompany Inspector on Inspection, if Requested.

PASSED: _____ FAILED: _____

Note 3: See Attached Sheet for Explanation if Inspection Failed. Re-inspection Required.

INSPECTOR SIGNATURE: _____ Date: _____

INTENTIONALLY LEFT BLANK

CONTRACTOR'S "DEVIATION NOTICE" INSPECTION REQUEST FORM

PROJECT: _____
DATE RECEIVED: _____ (by Inspector)
TIME RECEIVED: _____ (by Inspector)

DEVIATION NOTICE(S) (No.): _____

BUILDING: _____
SITE/OFFSITE: _____
CONSTRUCTION PHASE (1, 2, 3, etc.): _____
SPECIFICATION SECTION (No.): _____
SCOPE OF WORK: _____
(concrete, electrical, etc.)

INSPECTION REQUESTED BY: _____
(contractor company name)

LOCATION(S) OF WORK FOR INSPECTION (be specific- bldg.(s), room(s), etc.)

INSPECTION REQUESTED ON: _____ at _____ am/pm
(date) (time)

Note 1: A Minimum Notice of 48 hours is Required to be Received by the Inspection Officer Prior to the Time the "Deviation Notice" Inspection is Requested to Begin.

PRINT NAME OF PERSON REQUESTING DEVIATION NOTICE INSPECTION

SIGNATURE OF PERSON REQUESTING DEVIATION NOTICE INSPECTION

Note 2: Contractor Must Accompany Project Inspector on "Deviation Notice" Inspection, if Requested.

Note 3: See Attached "Deviation Notice" for Inspector's Comments and/or Date Completed.

PASSED: _____ FAILED: _____

PROJECT INSPECTOR SIGNATURE: _____
DATE: _____

INTENTIONALLY LEFT BLANK

CONTRACTOR'S FINAL INSPECTION REQUEST FORM

PROJECT: _____
DATE RECEIVED: _____ (by Inspector)
TIME RECEIVED: _____ (by Inspector)

BUILDING: _____
SITE/OFFSITE: _____
CONSTRUCTION PHASE (1, 2, 3, etc.): _____
SPECIFICATION SECTION (No.): _____
SCOPE OF WORK: _____
(concrete, electrical, etc.)

INSPECTION REQUESTED BY: _____
(contractor company name)

INSPECTION REQUESTED ON: _____ at _____ am/pm
(date) (time)

Note 1: A Minimum Notice of 48 hours is Required to be Received by the Inspection Officer Prior to the Time the Final Inspection is Requested to Begin. Contractor to be Notified by the Construction Manager in Regards to the Actual Date and Time of the Final Inspection.

PRINT NAME AND TITLE OF PERSON REQUESTING FINAL INSPECTION

SIGNATURE OF PERSON REQUESTING FINAL INSPECTION

Note 2: Contractor Must Accompany Project Inspector, Architect and/or Engineer(s) on Final Inspection, if Requested.

PASSED: _____ FAILED: _____

Note 3: If the Final Inspection Fails Re-Inspection is Required. See Attached Sheet for Comment(s).

PROJECT INSPECTOR SIGNATURE: _____
DATE: _____

PROJECT ARCHITECT SIGNATURE: _____
DATE: _____

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CONTRACTOR'S PUNCHLIST INSPECTION REQUEST FORM

PROJECT: _____
DATE RECEIVED: _____ (by Inspector)
TIME RECEIVED: _____ (by Inspector)

BUILDING: _____
SITE/OFFSITE: _____
CONSTRUCTION PHASE (1, 2, 3, etc.): _____
SPECIFICATION SECTION (No.): _____
SCOPE OF WORK: _____
(concrete, electrical, etc.)

INSPECTION REQUESTED BY: _____
(contractor company name)

LOCATION(S) OF WORK FOR INSPECTION: (be specific- bldg.(s), room(s), etc.)

DESCRIPTION OF WORK TO BE INSPECTED: (item number(s) from punchlist)

INSPECTION REQUESTED ON: _____ at _____ am/pm
(date) (time)

Note 1: A Minimum Notice of 48 hours is Required to be Received by the Inspection Officer Prior to the Time the Punchlist Inspection is Requested to Begin.

PRINT NAME OF PERSON REQUESTING PUNCHLIST INSPECTION

SIGNATURE OF PERSON REQUESTING PUNCHLIST INSPECTION

Note 2: Contractor Must Accompany Project Inspector on Punchlist Inspection, if Requested. Items Must Have Already Been Signed Off by Contractor.

Note 3: Attached Sheet for Contractor's Signoff and/or Inspector's Comments and/or Date Completed for the Specific Punchlist Items Noted Above.

Note 4: This Inspection is NOT A FINAL INSPECTION but Only an Acknowledgement That a Particular Item(s) is/are completed.

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PROJECT: _____ - CONTRACTOR'S PUNCHLIST
CONTRACTOR NAME: _____ Page _____ of _____

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SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely provide all required submittals and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 SUBMITTALS

- A. Contractor's responsibilities:
 - 1. The Contractor shall check, verify, and be responsible for all field measurements.
 - 2. The Contractor shall submit a schedule indicating when the required shop drawings and submittals will be submitted to the Architect.
 - a. Submit schedule within the amount of days as indicated in Specification Section - CONSTRUCTION SCHEDULES.
 - 3. Submit copies as scheduled below, checked and approved by the Contractor for all submittals required for the work of the various trades. Deliver submittals promptly to avoid delays in delivery of materials or execution of the work.
 - a. The Contractor (or Subcontractor) shall mark-up the submittals as to project specifics. If the specifications contains a schedule prepared by the Architect (i.e. paint symbols such as DW-1, M-1, CB-1, etc., or tile symbols such as CT-1, CT-2, or IWA, IWB, IWC, etc.), then the submittal will also contain those designations. Submittals without project specifics will be returned to the Contractor as not being properly prepared.
 - b. The Contractor shall stamp the Submittals utilizing any language requested by the Owner in the General Conditions and the following minimum language:

"This submittal has been reviewed by (Name of Contractor) and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. The Contractor has reviewed and approved not only the field dimensions, but the construction criteria, and has also made written notation regarding any information in the Shop Drawings that does not conform to the Contract Documents. The Contractor has reviewed this submittal and coordinated with all other Shop Drawings received to date by the Contractor and this duty of coordination has not been delegated to subcontractors, material suppliers, the Architect, or the design consultants on this project. The Contractor shall also have indicated that it has not relied upon the dimensions shown on the drawings, specifications and schedules, and that the Contractor has double-checked all dimensions for accuracy and fit. (Name of Contractor) also warrants that this submittal complies with the Contract Documents and comprises no variation thereto."

By: _____ Contractor's Signature

_____ Contractor's Typed Name

Date: _____

- c. Substitutions on shop drawings or in product submittals will not be considered without prior approval in accordance with Specification Section - SUBSTITUTION PROCEDURES. Submittals containing unacceptable items will be rejected.
 - d. The Contractor shall make any corrections required by the Architect during the Architect's initial review, and re-submit the required corrected copies for final review and distribution.
- B. Architect's responsibilities:
 - 1. The Architect will make any desired corrections with reasonable promptness, and return the submittal to the Contractor.
 - 2. The Architect's review of such drawings or schedules shall not relieve the Contractor of responsibility for deviations from the drawings or specifications, unless he has, in writing, called the Architect's attention to such deviations at the time of submission, and secured written acceptance.
 - a. The Architect's review shall be for general conformance with the design concept for the project and general compliance with the information given in the Contract Documents.
 - b. The Architect's review shall not be construed as an "approval," or to relieve the Contractor(s) and material suppliers of responsibility for errors or omissions in the submitted documents.
 - c. Modifications or comments made on the submittals or shop drawings during this review do not relieve the Contractor from compliance with the requirements of the drawings and specifications.
 - d. Acceptance of a specific item does not include acceptance of the assembly of which the item is a component.
- C. The following list of items, definitions and required quantities is a minimum required for this project. Verify with FACILITY SERVICES SUBGROUP sections for additional quantities required within those divisions.
 - 1. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, other product information, color choices and/or manufacturer's catalog sheets shall be specially prepared for the Project (marked-up with project specifics) and shall be submitted in sequential sets for each category of work:
 - a. Quantity:
 - 1) Unless otherwise indicated in the Contract Documents, provide Six (6) sets.
 - b. Material Safety Data Sheets (MSDS): MSDS are not required, but it is recognized that applicable federal and state laws require the submission of these data sheets to an Owner. MSDS shall be turned over to the Owner (without review by the Architect or it's consultants) in compliance with federal and state laws.
 - 2. Shop Drawings: Newly prepared information, drawn to accurate scale, consisting of drawings, diagrams, schedules, and other data specifically prepared for the Project by the Contractor, a Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Project. Do not reproduce Contract Documents or copy Standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
 - a. Quantity: Provide One (1) reproducible original (vellum, sepia or mylar) and Three (3) opaque (blue-line or black-line xerographic) prints for each sheet or detail.
 - 1) The contractor shall receive the marked-up reproducibles and copy the required number of sets to the subcontractor, manufacturer's and/or material suppliers.
 - b. Contractor's use of Architect's Electronic CAD Files.

- 1) Upon written request by Contractor, copies of the Architect's electronic CAD files may be available for Contractor's use in connection with this Project.
 - a) Contractor's written request shall be on the Architect's "Contractor's Document Usage Agreement for Requested Documents" and may include an additional Architect's Consultant's Agreements, outlining conditions for providing files.
 - b) Contractor's request shall be limited to drawings directly applicable to the Shop Drawings the Contractor wishes to create for submittal.
 - c) Contractor shall pay the Architect for work incurred for providing the requested files. Payment shall be submitted with the request.
- 2) The Architect's electronic CAD files are limited to files that already exist and that not all files may be available at the Architect's and Architect's Consultant's discretion.
- 3) The Architect's electronic CAD files are not part of the Contract Documents and have limitations to the accuracy, incorporating modifications, CAD system formats, CAD entity attributes and layering.
- 4) The Architect's electronic CAD files have restrictions on Contractor's use, transmittal and delivery of files.
3. Samples: Physical examples specially prepared for the Project (marked-up with project specifics) which illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.
 - a. Quantity:
 - 1) Unless otherwise indicated in the Contract Documents, provide Four (4) sets.
 - b. Color samples shall be submitted on 8-1/2" x 11" cards for all colors scheduling paint types specified utilizing the paint symbols designated by the Architect in the drawings and specifications.
 - c. Manufactured devices or equipment items:
 - 1) Quantity: One (1) sample, returned to supplier and which, when approved, may be incorporated into the Project.
4. Quality Assurance/Control submittals: Consists of design data, test reports, certificates, manufacturers instructions, and /or manufacturer's field reports.
 - a. Quantity:
 - 1) Unless otherwise indicated in the Contract Documents, provide Six (6) sets.
5. Closeout submittals: Maintenance data, operating manuals, project documents, engineering calculations, and/or warranties shall be submitted when required in the various specification sections:
 - a. Quantity:
 - 1) Unless otherwise indicated in the Contract Documents, provide Two (2) sets.
6. Field Samples: Sample panels of in place construction, or selected area of completed substrates or work showing the anticipated compliance with specified characteristics in order to establish a standard of quality.
 - a. Quantity:
 - 1) See specific specification section requirements.
7. Mockups: Full-sized erected assemblies, used for coordination purposes or for testing in a laboratory, or required for approval in a finish form before the actual Project construction begins.
 - a. Quantity:
 - 1) See specific specification section requirements.
- D. Substitution, Dispute or Claim Submittals:

SUBMITTAL PROCEDURES

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1. Any substitution, dispute or claim submittals relating to this contract, or any Contract breach, which are not disposed of by agreement shall be promptly submitted in accordance with the GENERAL CONDITIONS, as a claim to and decided by the Architect who shall issue a written decision on the dispute.
2. Adequate supporting data shall include, but is not limited; a statement of the reasons for the asserted entitlement, the certified payroll, invoice for material and equipment rental, and an itemized breakdown of any adjustment sought.
3. If no "SUBMISSION UNDER PENALTY OF PERJURY" clause is provided within the GENERAL CONDITIONS, then the Contractor shall certify, at the time of submission of a substitution, dispute or claim, as follows:

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SUBMISSION UNDER PENALTY OF PERJURY

I _____, being the _____ (Must be an officer), declare under penalty of perjury under the laws of the State of California, and do personally certify and attest that: I have thoroughly reviewed the attached substitution, dispute or claim for additional compensation and/or extension of time, and know its contents, and said claim is made in good faith; the supporting data is truthful and accurate; that the amount required accurately reflects the contract adjustment for which the Contractor believes the Owner is liable; and further, that I am familiar with California Government Code Section 12650, et seq, pertaining to false claims, and further know and understand that submission of certification of a false claim may lead to fines, imprisonment and/or other severe legal consequences.

By: _____ Contractor's Signature

_____ Contractor's Typed Name

Date: _____

Submission of a substitution, dispute or claim, properly certified, with all required supporting documentation, and written rejection or denial or all or part of the claim by Owner, is a condition precedent to any action, proceeding, litigation, suit or demand for arbitration by Contractor.

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PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 SCHEDULES

- A. The following schedule was prepared to assist the Contractor in knowing the required submittals for this project, but may not be complete. Specific submittal information as to what is required is contained within the individual specification sections and those individual sections shall govern in the event of a question.

B. SUBMITTAL SCHEDULE

1. 01 11 13 - SUMMARY OF WORK
 - a. QUALITY ASSURANCE/ CONTROL SUBMITTALS
2. 01 25 00 - SUBSTITUTION PROCEDURES
 - a. SUBSTITUTION REQUEST FORMS
3. 01 29 73 - SCHEDULE OF VALUES
 - a. SCHEDULE OF VALUES
4. 01 32 16 - CONSTRUCTION SCHEDULES
 - a. CONSTRUCTION SCHEDULE, SHOP DRAWING SUBMITTAL SCHEDULE, CRITICAL PATH SCHEDULES, FRAGNETS.
5. 01 32 26 - FORMS AND REPORTS
 - a. AS REQUIRED BY THIS SPECIFICATION SECTION AND OTHER SPECIFICATION SECTIONS.
6. 01 33 00 - SUBMITTAL PROCEDURES
 - a. SHOP DRAWING AND SUBMITTAL SCHEDULE, COLOR SAMPLES OF ALL FINISH MATERIALS FOR COLOR BOARD SELECTION.
7. 01 45 29 - TESTING LABORATORY SERVICES
 - a. TESTING SCHEDULE, TEST REPORTS
8. 01 71 23 - FIELD ENGINEERING
 - a. COORDINATION DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS.
9. 01 77 20 - PROJECT CLOSEOUT
 - a. ANOTATED CONTRACTOR'S AND ARCHITECT'S PUNCH LIST. ALL OPERATIONAL DATA, ALL MAINTENANCE MANUALS, ALL EXTRA MATERIALS.
10. 01 78 36 - WARRANTIES
 - a. ALL GUARANTEES AND WARRANTIES
11. 01 78 39 - PROJECT DOCUMENTS
 - a. PROJECT "AS-BUILT" DOCUMENTS, PROJECT "RECORD" DOCUMENTS AND PROJECT "CERTIFICATION" DOCUMENTS.
12. 03 11 01 - CONCRETE FORMWORK
 - a. PRODUCT DATA, SAMPLES, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS.
13. 03 15 14 - DRILLED ANCHORS
 - a. PRODUCT DATA, ICC EVALUATION SERVICE REPORTS, DSA APPROVAL LETTERS.
14. 03 20 00 - REINFORCEMENT
 - a. SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS.
15. 03 30 00 - CAST-IN-PLACE CONCRETE

- a. PRODUCT DATA, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS.
- 16. 03 35 10 - POLISHED CONCRETE FINISHING
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/ CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS.
- 17. 03 52 13 - INSULATING CONCRETE
 - a. PRODUCT DATA, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS.
- 18. 04 21 13 - THIN BRICK VENEER
 - a. SAMPLES, COLOR SAMPLES, PRODUCT DATA CERTIFICATION.
- 19. 04 22 00 - CONCRETE MASONRY UNITS
 - a. SAMPLES, COLOR SAMPLES, PRODUCT DATA CERTIFICATION.
- 20. 04 23 00 - GLASS MASONRY UNITS
 - a. SAMPLES, COLOR SAMPLES, PRODUCT DATA CERTIFICATION.
- 21. 05 12 00 - STEEL AND FABRICATIONS
 - a. PRODUCT DATA, SHOP DRAWINGS, SAMPLES, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS.
- 22. 05 30 00 - METAL DECK
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS.
- 23. 05 52 00 - RAILING SYSTEMS
 - a. MATERIALS LIST, SHOP DRAWINGS, AND WARRANTIES.
- 24. 06 10 00 - ROUGH CARPENTRY
 - a. PRODUCT DATA, CERTIFIATES OF COMPLIANCE, AND WARRANTIES.
- 25. 06 18 00 - GLUE-LAMINATED CONSTRUCTION
 - a. SHOP DRAWINGS, VERIFIED REPORTS, AND WARRANTIES.
- 26. 06 22 00 - MILLWORK
 - a. PRODUCT DATA, SHOP DRAWINGS, AND WARRANTIES.
- 27. 06 41 23 - MODULAR CASEWORK
 - a. SHOP DRAWINGS, MANUFACTURER'S SPECIFICATIONS, COLOR SAMPLES, MOCK-UP, WI CERTIFICATION.
- 28. 06 61 16 - SOLID SURFACING
 - a. SHOP DRAWINGS, MANUFACTURER'S SPECIFICATIONS, COLOR SAMPLES, MOCK-UP, WI CERTIFICATION.
- 29. 07 14 16 - FLUID-APPLIED WATERPROOFING
 - a. PRODUCT DATA, INSTALLATION INSTRUCTIONS, CLOSEOUT SUBMITTALS.
- 30. 07 18 50 - VAPOR-ALKALINITY CONTROL
 - a. PRODUCT DATA, INSTALLATION INSTRUCTIONS, CLOSEOUT SUBMITTALS.
- 31. 07 21 00 - INSULATION
 - a. PRODUCT DATA, INSTALLATION INSTRUCTIONS, CLOSEOUT SUBMITTALS.
- 32. 07 31 13 - SHINGLES
 - a. PRODUCT DATA, SHOP DRAWINGS, SAMPLES, CLOSOUT SUBMITTALS.
- 33. 07 40 00 - METAL PANELS
 - a. PRODUCT DATA, SHOP DRAWINGS, SAMPLES, CLOSOUT SUBMITTALS.
- 34. 07 40 12 - MCM PANELS
 - a. PRODUCT DATA, SHOP DRAWINGS, SAMPLES, CLOSEOUT SUBMITTALS.
- 35. 07 42 43 - FIBER-CEMENT PANELS
 - a. PRODUCT DATA, SHOP DRAWINGS, SAMPLES, CLOSEOUT SUBMITTALS.

36. 07 51 13 - BUILT-UP ROOFING
 - a. PRODUCT DATA, SHOP DRAWINGS AND WARRANTIES.
37. 07 53 16 - ELASTOMERIC MEMBRANE ROOFING
 - a. PRODUCT DATA, SHOP DRAWINGS AND WARRANTIES.
38. 07 53 29 - ELASTOMERIC MEMBRANE ROOFING
 - a. PRODUCT DATA, SHOP DRAWINGS AND WARRANTIES.
39. 07 60 00 - SHEET METAL
 - a. SHOP DRAWINGS
40. 07 72 00 - ROOF ACCESSORIES
 - a. PRODUCT DATA, SHOP DRAWINGS, SAMPLES AND WARRANTIES.
41. 07 81 16 - FIREPROOFING
 - a. MATERIALS LIST, COLORS, MANUFACTURER'S DATA, TEST DATA AND SAMPLES.
42. 07 84 00 - FIRESTOPPING
 - a. PRODUCT DATA, CERTIFICATIONS, SHOP DRAWINGS QUALIFICATION DATA ON INSTALLERS.
43. 07 92 00 - SEALANTS
 - a. PRODUCT DATA, COLORS AND WARRANTIES.
44. 07 95 00 - EXPANSION JOINTS
 - a. MATERIALS LIST, SHOP DRAWINGS, AND WARRANTIES.
45. 08 11 00 - METAL DOORS AND FRAMES
 - a. PRODUCT DATA AND SHOP DRAWINGS.
46. 08 14 16 - WOOD DOORS
 - a. PRODUCT DATA AND SHOP DRAWINGS.
47. 08 15 13 - LAMINATE-FACED WOOD DOORS
 - a. PRODUCT DATA AND SHOP DRAWINGS.
48. 08 33 00 - COILING DOORS
 - a. PRODUCT DATA, SHOP DRAWINGS AND WARRANTIES.
49. 08 34 73 - ACOUSTICAL DOORS AND FRAMES
 - a. PRODUCT DATA, SHOP DRAWINGS AND WARRANTIES.
50. 08 41 00 - STOREFRONTS
 - a. PRODUCT DATA, SHOP DRAWINGS AND WARRANTIES.
51. 08 51 13 - ALUMINUM WINDOWS
 - a. PRODUCT DATA, SHOP DRAWINGS AND WARRANTIES.
52. 08 56 59 - SERVICE WINDOWS
 - a. PRODUCT DATA, SHOP DRAWINGS AND WARRANTIES.
53. 08 63 00 - SKYLIGHTS
 - a. PRODUCT DATA, SHOP DRAWINGS AND WARRANTIES.
54. 08 70 00 - HARDWARE
 - a. HARDWARE SCHEDULE AND CERTIFICATES.
55. 08 80 00 - GLASS
 - a. PRODUCT DATA, MATERIALS LIST, SAMPLES AND CERTIFICATES.
56. 08 91 00 - LOUVERS
 - a. PRODUCT DATA, SHOP DRAWINGS, CERTIFICATES AND COLORS.
57. 09 22 16 - METAL FRAMING
 - a. PRODUCT DATA (INCLUDING INSTALLATION METHODS) AND MATERIALS LIST.
58. 09 24 00 - CEMENT PLASTER
 - a. PRODUCT DATA (INCLUDING INSTALLATION METHODS) AND MATERIALS LIST.
59. 09 26 13 - VENEER PLASTER

- a. PRODUCT DATA (INCLUDING INSTALLATION METHODS) AND MATERIALS LIST.
- 60. 09 29 00 - GYPSUM BOARD
 - a. PRODUCT DATA, FASTENING SCHEDULE AND SAMPLES.
- 61. 09 30 00 - TILE
 - a. PRODUCT DATA, COLORS, SAMPLES, CERTIFICATES, MAINTENANCE MATERIAL AND WARRANTIES.
- 62. 09 51 00 - ACOUSTICAL CEILINGS
 - a. ACOUSTICAL TILE SAMPLES, SUSPENSION SYSTEM SAMPLES AND DSA APPROVED CEILING BRACING DRAWINGS.
- 63. 09 64 29 - HARDWOOD FLOOR
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 64. 09 64 66 - RESILIENT WOOD FLOOR
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 65. 09 65 10 - RESILIENT BASE AND ACCESSORIES
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 66. 09 65 16 - RESILIENT SHEET
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 67. 09 65 19 - RESILIENT TILE
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 68. 09 67 23 - RESINOUS FLOORING
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 69. 09 68 40 - CARPET
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 70. 09 72 00 - WALL COVERINGS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 71. 09 91 00 - PAINTING
 - a. PRODUCT DATA, MATERIALS LIST, COLORS, MAINTENANCE INFORMATION AND WARRANTIES.
- 72. 10 05 00 - MISCELLANEOUS SPECIALTIES
 - a. PRODUCT DATA, COLORS AND SAMPLES (WHERE APPLICABLE) FOR ALL ITEMS.
- 73. 10 11 00 - VISUAL DISPLAY BOARDS
 - a. PRODUCT DATA AND SAMPLE COLORS.
- 74. 10 13 00 - DIRECTORIES
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 75. 10 14 00 - IDENTIFYING DEVICES
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 76. 10 14 53 - ROAD AND PARKING SIGNAGE
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 77. 10 21 13 - TOILET PARTITIONS
 - a. PRODUCT DATA, SHOP DRAWINGS, CERTIFICATES AND COLORS.

- 78. 10 26 00 - WALL AND CORNER GUARDS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 79. 10 28 13 - TOILET ACCESSORIES
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 80. 10 44 00 - FIRE PROTECTION SPECIALTIES
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 81. 10 51 13 - METAL LOCKERS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 82. 10 56 13 - METAL STORAGE SHELVING
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 83. 11 16 16 - SAFES
 - a. PRODUCT DATA, SHOP DRAWINGS, CERTIFICATES AND COLORS.
- 84. 11 40 00 - FOOD SERVICE EQUIPMENT
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 85. 11 53 00 - LAB CASEWORK AND EQUIPMENT
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 86. 11 66 00 - ATHLETIC EQUIPMENT
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 87. 11 66 43 - SCOREBOARDS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 88. 11 68 00 - PLAYFIELD EQUIPMENT
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 89. 12 21 00 - BLINDS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 90. 12 61 00 - FIXED SEATING
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 91. 12 66 13 - TELESCOPING BLEACHERS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 92. 12 66 23 - TELESCOPING CHAIR PLATFORMS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 93. 13 34 23 - CUSTOM PORTABLE BUILDINGS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 94. 13 49 00 - RADIATION PROTECTION
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 95. 14 24 23 - HYDRAULIC ELEVATORS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.

- 96. 14 42 00 - WHEELCHAIR LIFTS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 97. 14 45 00 - VEHICLE LIFTS
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, CLOSEOUT SUBMITTALS AND WARRANTIES.
- 98. DIV 21 - FIRE SUPPRESSION SECTIONS
 - a. REFER TO APPROPRIATE SPECIFICATION SECTION REQUIREMENTS.
- 99. DIV. 22 - PLUMBING SECTIONS
 - a. REFER TO APPROPRIATE SPECIFICATION SECTION REQUIREMENTS.
- 100. DIV. 23 -HEATING, VENTILATING AND AIR CONDITIONING SECTIONS
 - a. REFER TO APPROPRIATE SPECIFICATION SECTION REQUIREMENTS.
- 101. DIV. 25- INTEGRATED AUTOMATION SECTIONS
 - a. REFER TO APPROPRIATE SPECIFICATION SECTION REQUIREMENTS.
- 102. DIV. 26- ELECTRICAL SECTIONS
 - a. REFER TO APPROPRIATE SPECIFICATION SECTION REQUIREMENTS.
- 103. DIV. 27 -COMMUNICATIONS SECTIONS
 - a. REFER TO APPROPRIATE SPECIFICATION SECTION REQUIREMENTS.
- 104. DIV. 28- ELECTRONIC SAFETY AND SECURITY SECTIONS
 - a. REFER TO APPROPRIATE SPECIFICATION SECTION REQUIREMENTS.
- 105. 31 20 00 - EARTHWORK
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, PROJECT RECORD DOCUMENTS, AND WARRANTIES, AND DRAWINGS SHOWING KNOWLEDGE OF THE EXTENT OF ENGINEERED PADS.
- 106. 31 31 00- SOIL TREATMENT
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, PROJECT RECORD DOCUMENTS, AND WARRANTIES.
- 107. 32 12 00- PAVEMENT
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, PROJECT RECORD DOCUMENTS, AND WARRANTIES.
- 108. 32 80 00- LANDSCAPE IRRIGATION
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, PROJECT RECORD DOCUMENTS, AND WARRANTIES.
- 109. 33 40 00- STORM DRAINAGE
 - a. PRODUCT DATA, SHOP DRAWINGS, QUALITY ASSURANCE/CONTROL SUBMITTALS, PROJECT RECORD DOCUMENTS, AND WARRANTIES.

END OF SECTION

SECTION 01 35 16 – ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Coordinate the work of trades and schedule elements of alterations and renovation work by procedures and methods to expedite completion of the work.
- C. In addition to demolition specifically shown, cut, move or remove items as necessary to provide access or to allow alterations and new work to proceed. Include such items as:
 - 1. Repair or removal of hazardous or unsanitary conditions.
 - 2. Removal of abandoned items and items serving no useful purpose, such as abandoned piping, conduit and wiring.
 - 3. Removal of unsuitable or extraneous materials not marked for salvage, such as abandoned furnishings and equipment, and debris such as rotted wood, rusted metals and deteriorated concrete.
 - 4. Cleaning of surfaces, and removal of surface finishes as needed to install new work and finishes.
- D. Patch, repair and refinish existing items to remain, to the specified condition for each material, with a smooth and clean transition to adjacent new items of construction.
- E. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 02 41 19 SELECTIVE DEMOLITION
 - 4. 03 30 00 CAST-IN-PLACE CONCRETE
 - 5. 08 11 00 METAL DOORS AND FRAMES
 - 6. 09 29 00 GYPSUM BOARD
 - 7. 09 30 00 TILE
 - 8. 09 50 00 ACOUSTICAL CEILINGS
 - 9. 09 91 00 PAINTING
 - 10. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 11. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

PART 2 - PRODUCTS

2.1 MATERIALS (Products for Patching, Extending and Matching):

- A. Provide same products or types of construction as that in existing structure as needed to patch, extend or match existing.
- B. The Contract Documents will not typically define products or standards of workmanship present in existing construction; determine products by inspection and necessary testing, and determine quality of workmanship by using existing as a sample for comparison.
- C. The presence of a product, finish, or type of construction requires that patching, extending or matching shall be performed as necessary to make work complete and consistent with identical standards of quality.

PART 3 - EXECUTION

3.1 REPAIR / RESTORATION

- A. Patch and extend existing construction using skilled workers capable of matching existing quality of workmanship. Quality of patched or extended work shall be not less than that specified for new work.
- B. Damaged Surfaces:
 - 1. Patch and replace portions of existing finished surfaces that are found to be damaged, lifted, discolored, or show other imperfections, with matching material.
 - a. Provide adequate support of substrate prior to patching the finish.
 - b. Refinish patched portions of painted or coated surfaces in a manner to produce uniform color and texture over the entire surface.
 - c. When existing surface finish cannot be matched, refinish entire surface to nearest intersections.
- C. Transition from existing to new work:
 - 1. When new work abuts or finishes flush with existing work, make a smooth and clean transition. Patched work shall match existing adjacent work in texture and appearance so that the patch of transition is invisible at a distance of five feet.
 - 2. When finished surfaces are cut in such a way that a smooth and clean transition with the new work is not possible, notify the Architect. Terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface, or as otherwise directed by the Architect.

3.2 ADJUSTING

- A. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
- B. Where partitions are removed, patch floors, walls, and ceilings with finish materials to match existing.
 - 1. Where removal of partitions results in adjacent spaces becoming one, re-work floors and ceilings to provide smooth and clean planes without breaks, steps, or bulkheads.
 - 2. Where extreme change of plane of one inch or more occurs, request instruction from the Architect as to method of making transition.
- C. Trim and refinish existing doors as necessary to clear new floor finishes.

3.3 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
 - 1. Leave area level and free of any ruts or debris. Appearance of earth surface shall be equal to or better than adjacent undisturbed surfaces.
 - 2. Clean any soiled surfaces immediately.
 - 3. Finish shall be clean and ready for the application of any additional finishes.
- B. Perform periodic and final cleaning as specified in Specification Section - PROJECT CLOSEOUT.
 - 1. Clean Owner-occupied areas daily.
 - 2. Clean spillage, over spray, and heavy collection of dust in Owner-occupied areas immediately.
- C. At completion of work of each trade, clean area and make surfaces ready for work of successive trades.
- D. At completion of alteration work in each area, provide final cleaning and return space to a condition suitable for use by the Owner.

- E. Contractor shall remove all materials and items as indicated on drawings or otherwise required. Remove all trash or debris as it accumulates and legally dispose of it off site at no additional cost to the Owner.

3.4 PROTECTION

- A. Protection from weather:
 - 1. Protect newly installed work from freezing for 24 hours after erection, installation or application.
- B. Protection from traffic:
 - 1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.
 - 2. Immediately after cleaning, neatly apply four (4) mil thick, minimum, polyethylene film over finished surfaces at traffic areas. Fasten film firmly to surfaces without visually marring those surfaces.
- C. Assign the work of moving, removal, cutting and patching, to trades qualified to perform the work in a manner to minimize the possibility of damage to each type of work, and provide means of returning surfaces to appearance of new work.
- D. Perform cutting and removal work with minimal disruption and manner to avoid damage to adjacent work.
- E. Cut finish surfaces such as masonry, tile, plaster or metals, by methods which terminate surfaces in a straight line at a natural point of division.
- F. Perform cutting and patching as specified in Specification Section - CUTTING AND PATCHING.
- G. Protect existing finishes, equipment, and adjacent construction from damage.
 - 1. Protect existing and new work from weather and extremes of temperature.
 - 2. Maintain existing interior work above 60 degrees F.
 - 3. Provide weather protection, waterproofing, heat and humidity control as needed to prevent damage to remaining work and to new work.

3.5 SCHEDULES

- A. Schedule work in the sequences specified in Specification Section - SUMMARY OF WORK, if applicable.

END OF SECTION

SECTION 01 41 00 – REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
 - 2. Section 4-317 (c), Part 1, Title 24, CCR, requires the following:
 - a. "The intent of these drawings and specifications is that the work of the alteration, rehabilitation or reconstruction is to be in accordance with Title 24, California Code of Regulations. Should any existing conditions such as deterioration of non-complying construction be discovered which is not covered by 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."
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 REFERENCES

- C. References to standards, codes, specifications, recommendations and regulations, refer to the latest edition or printing in effect at the date of issue shown in the Documents unless another date is implied by the suffix number of the Standards.
- D. Applicable portions of the Standards listed that are not in conflict with the Contract Documents shall be construed as specification for this work.
- E. General Standards:
 - 1. AFPA American Forest and Paper Association
 - 2. ANSI American National Standards Institute
 - 3. ASTM American Society for Testing and Materials
 - 4. CAL/OSHA California Occupational Safety and Health Administration
 - a. State of California Construction Safety Orders
 - 5. CARB California Air Resources Board
 - 6. CS Commercial Standards of the US Department of Commerce
 - 7. EPA Environmental Protection Agency
 - 8. FMG Factory Mutual Group
 - 9. NIBS National Institute of Building Sciences
 - 10. NIST National Institute of Standards and Technology
 - 11. NFPA National Fire Protection Association
 - 12. OSHA Occupational Safety and Health Administration
 - a. Federal Construction Safety Orders
 - 13. PS Product Standards of the US Department of Commerce
 - 14. SS-CDOT "Standard Specification":
 - a. State of California Department of Transportation (CalTrans)

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- 15. UL Underwriters Laboratory Incorporated
- 16. WH Warnock Hersey

1.3 SUBMITTALS

- 17. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
- 18. Quality Assurance/Control Submittals:
 - a. Certificates:
 - 1) Submit three (3) copies of certificates written on the Contractor's Letterhead indicating that the required codes shall be present at the Job Site.

1.4 QUALITY ASSURANCE

F. Regulatory Requirements:

- 1. All codes, laws, ordinances, rules, regulations, orders and other legal requirements of City, County, State, Federal and other public authorities which bear on performances of Work shall be applicable to Project. Latest editions shall be applicable unless specified otherwise.
- 2. Relationship between Applicable Codes and Contract Documents. The Contract Documents have been developed with the intent to conform to the applicable codes. Nothing within the Contract Documents shall be construed to permit Work not conforming to the applicable codes.

G. Major Governing Codes And Regulations:

- 1. General: All work shall comply with the requirements of the following codes and regulations. Special reference in other Sections of the Specifications to a specific code will be by use of the abbreviation given in front of the Code.
 - a. Freestanding equipment (if applicable) shall be provided and installed in accordance with the seismic requirements where the Project is located.
- 2. NOTE: * -Indicates that a copy of these codes shall be at the job site at all times.
- 3. AUTHORITY HAVING JURISDICTION:
 - a. AHJ: Authority Having Jurisdiction
- 4. FEDERAL LAW:
 - a. ADA: Americans with Disabilities Act
- 5. CALIFORNIA CODE OF REGULATIONS (Previously known as the California Administrative Codes)
 - a. CCR-T5: California Code of Regulations, Title 5-Education.
 - b. CCR-T8: California Code of Regulations, Title 8-Industrial Safety
 - 1) Contains the California Elevator Safety Code.
 - c. CCR-T19: California Code of Regulations, Title 19-Public Safety.
 - d. CCR-T21: California Code of Regulations, Title 21-Public Works.
 - e. *CCR-T24: California Code of Regulations, Title 24, Part 1-California Administrative Code 2022.
- 6. CALIFORNIA BUILDING, ELECTRICAL, MECHANICAL, PLUMBING, ENERGY, FIRE, and REFERENCED CODES
 - a. *CBC: California Building Code 2022 California Code of Regulations, Title 24-Part 2, Volumes 1 and 2, CCR-T24, based on the 2021 edition of the IBC (International Building Code), with the latest California State Amendments.
 - b. *CEC: California Electrical Code 2022, California Code of Regulations, Title 24-Part 3, CCR-T24, based on the 2020 edition of the NEC (National Electrical Code), with the latest California State Amendments.
 - c. *CMC: California Mechanical Code 2022, California Code of Regulations, Title 24, Part 4, CCR-T24, based on the 2021 edition of the UMC (Uniform Mechanical Code) by IAPMO, with the latest California State Amendments.

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- d. *CPC: California Plumbing Code 2022, California Code of Regulations, Title 24, Part 5, CCR-T24, based on the 2021 edition of the UPC (Uniform Plumbing Code) by IAPMO, with the latest California State Amendments.
- e. *CEnC: California Energy Code 2022, California Code of Regulations, Title 24, Part 6, CCR-T24, and the latest California State Amendments.
- f. *CFC: California Fire Code 2022, California Code of Regulations, Title 24, Part 9, CCR-T24, based on the 2021 edition of the IFC (International Fire Code), with the latest California State Amendments.
 - 1) In addition to all other Chapters in the CFC to be followed, attention is specifically called out to comply with Chapter 33 - "Fire Safety During Construction and Demolition".
- g. CEBC: California Existing Building Code 2022, California Code of Regulations, Title 24, Part 10, CCR-T24.
- h. CGBSC: California Green Building Standards Code 2022, California Code of Regulations, Title 24-Part 11, CCR-T24 (CALGreen).
- i. CRSC: California Referenced Standard Code 2022, Title 24, Part 12, CCR-T24, with the latest California State Amendments.
- 7. DSA: DIVISION OF THE STATE ARCHITECT:
 - a. DSA: Regulations of the Division of the State Architect of the State of California:
 - 1) ACS: Access Compliance Section
 - 2) SSS: Structural Safety Section
 - 3) FLS: Fire and Life Safety Section
 - 4) IR: Interpretation of Regulations.
- 8. DEPARTMENT OF HEALTH CARE ACCESS AND INFORMATION (formerly OSHPD).
 - a. HCAI: Regulations of the "Department of Health Care Access and Information" of the State of California.
- 9. OTHER STATE AGENCIES:
 - a. AQMCD: Air Quality Management Control District in the area where the project is located.
 - b. RWQCB: Regional Water Quality Control Board in the area where the project is located.
- H. Governing Authority:
 - 1. DSA: Division of the State Architect.
 - a. The provisions of the State of California, Statutes of 1933, Chapter 59, Safety of Construction of Public School Buildings Act, and the latest regulation based thereon, of the Division of the State Architect of the State of California, shall be the governing authority and shall take precedence over other applicable codes.
 - b. The following shall be stamped and signed by the A/E on Record or Delegated Design Professional per CBC, Part 1, Section 4-317 (h), and the following:
 - 1) Addenda or Bulletins per Sec. 4-338(b): All addenda or bulletins shall be signed and approved by the Division of State Architect.
 - 2) Construction Changes per Sec. 4-338(c): All Construction Changes related to structural items, fire safety issues, life safety issues and accessibility compliance issues shall be reviewed and approved by the appropriate Division of the State Architect.
 - 3) Substitutions (per DSA) shall be treated like Addenda, or Construction Changes per Sec. 4-338(c), and IR A-6: All substitution requests and substitutions related to structural items, fire safety issues, life safety issues and accessibility compliance issues shall be reviewed and approved by the appropriate Division of the State Architect prior to fabrication and installation.

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2. HCAI: Department of Health Care Access and Information.
3. AHJ: Authority Having Jurisdiction.
 - a. This Project will be under the authority of:
 - 1) The City of Fresno Codes and Standards.
 - 2) The County of Fresno Codes and Standards.
 - 3) --Other--

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 42 00 – REFERENCES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
 - a. The abbreviations, symbols and work meanings not defined in the Contract Documents are in accordance with building industry usage and convention. Questions which arise as to "meaning," or intent shall be referred to the Architect prior to bidding for interpretation.
 - b. Refer to drawings for additional abbreviations and symbols.
 - c. Refer to GENERAL and SPECIAL or SUPPLEMENTAL CONDITIONS and specific specification Sections for additional definitions.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

- A. EXECUTE Perform what is required to install, apply, erect and otherwise incorporate products in to this Project.
- B. FURNISH Supply products required, deliver to Project, unload, store and install as required in location as directed by Contractor, Owner or Architect.
- C. GUARANTEE An assurance by the seller or installer that products or Work are as represented or will be as promised in compliance with Specifications. Synonymous and interchangeable with WARRANTY.
- D. INSTALL Incorporate into this Project.
- E. PRODUCTS The material, equipment, fixtures and other physical substances required to execute the Project.
- F. PROVIDE Furnish and Install into this Project.
- G. WARRANTY An assurance by the seller or installer that products or Work are as represented or will be as promised in compliance with Specifications. Synonymous and interchangeable with GUARANTEE.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 45 23 – TESTING AND INSPECTION SERVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. One Project Inspector (Owner's Inspector), including Special and/or Assistant Inspector(s) (minimum Class 1 Rating), as required, will be employed by the Owner in accordance with the requirements of CCR-Title 24, Part 1, CALIFORNIA ADMINISTRATIVE CODE, and the latest amendments, and will be assigned to the Project.
 - a. Duties of a Project Inspector are specifically defined in CCR-Title 24, Part 1, and the latest amendments.
 - b. Special Inspections (not within the Project Inspector's abilities) shall be performed by the Testing Laboratory or other Special Inspector as approved by the Owner and DSA.
 - 1) All Special Inspections shall be approved by DSA in accordance with CCR-T24, Part 1, Chapter 4, Group 1, Article 5, Section 4-335.1.
 - 2. The Project Inspector shall be employed by the Owner and approved by the Architect, Structural Engineer, and DSA.
 - a. See the Title Page of this Project Manual for the name of this Project.
 - b. Payment of the Project Inspector will be by the Owner.
 - 3. Provide all access, facilities and information required by the Project Inspector for the Project.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

- A. Responsibilities of the Project Inspector:
 - 1. The Project Inspector will be required to provide inspection of the Work (including "Continuous Inspection") as required in CCR-T24, Part 1:
 - a. Educational Work: Chapter 4, Group 1, Article 6, 4-342 (b).
 - 2. The Project Inspector will report to the Owner, the Architect and DSA as required during the progress of the Work.
 - 3. The Project Inspector shall review all Pay Requests prior to submittal to the Architect.
- B. Responsibilities of the Contractor:
 - 1. Written Statement of Responsibility to the Owner and the Authority Having Jurisdiction (DSA) per CBC Chapter 17A:
 - a. Provide a written Statement of Responsibility regarding the Contractor's understanding of the special inspection requirements and identifying individuals in their firm responsible for exercising control over the conformance to the construction documents.
 - 2. Provide the Project Inspector free access to any and all parts of the Project at all times.
 - 3. Provide the Project Inspector information necessary to keep him fully informed with respect to the progress, manner and character of Work.

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4. Perform no Work in absence of the Project Inspector unless alternate arrangements have been made in advance and agreed to by the Owner, the Architect and DSA.
5. The Owner's "Inspection of Work" by the Project Inspector shall not relieve the Contractor from any conditions of this Contract.

1.3 SUBMITTALS

A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:

1. Quality Assurance/Control Submittals:
 - a. Written Statement of Responsibility to the Owner and the Authority Having Jurisdiction per CBC Chapter 17A.
 - b. Project Inspector's Field Reports:
 - 1) Submit four (4) copies of reports.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. In accordance with Specification Section - REGULATORY REQUIREMENTS.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 45 29 – TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. The Owner's Testing Laboratory shall be employed by the Owner and approved by the Architect, Structural Engineer, and DSA.
 - a. Payment of the Owner's Testing Laboratory will be by the Owner.
 - b. The Owner shall pay for all initial testing indicated as paid for by Owner except as specified otherwise or in the schedule at the end of this section.
 - 1) Cost of re-testing (due to initial failures) shall be back-charged to the Contractor, and those excess costs will be deducted from the Contract Price.
 - 2) Cost of testing (due to shop fabrication or in-plant testing out of state and beyond a 75-mile radius of the Project Site) shall be back-charged to the Contractor, and those excess costs will be deducted from the Contract Price.
 - 2. Provide all access, facilities and information required for the testing of the various portions of the Work as required by Regulatory Agencies, Planning, Agencies, Building Agencies, and other Governmental Inspectors, the Contract Documents and the Owner.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

- A. Responsibility of the Testing Laboratory:
 - 1. Taking all specimens.
 - 2. Performing Tests.
 - a. The Testing Laboratory's duties shall include all tests required by the DSA 103 Form prepared at the time of DSA Approvals, and any other testing as determined by authorities or the Project Inspector during the course of the work.
 - b. Special Inspections (not within the Project Inspector's abilities) shall be performed by the Testing Laboratory or other Special Inspector as approved by the Owner and DSA.
 - 1) All Special Inspections shall be approved by DSA in accordance with CCR-T24, Part 1, Chapter 4, Group 1, Article 5, Section 4-335.
 - 3. Writing Test Reports
 - 4. Review of "Continuous Inspection" reports by the Project Inspector.
 - a. Portions of the Work requiring "Continuous Inspection" shall be performed by the Project Inspector (if qualified) and all reports will be reviewed by the Testing Laboratory.
 - 5. Distribute Test Reports to the Owner, Architect, applicable Engineer, Contractor and to DSA.
- B. Responsibilities of the Contractor:
 - 1. Contractor shall provide a Testing Schedule that is in accordance with the following:
 - a. Format of the Testing Schedule shall be in accordance with Specification Section – CONSTRUCTION SCHEDULES.

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- b. Cooperates with the Testing Laboratory's schedule of required testing.
- c. Contractor shall coordinate Construction Schedule and Testing Schedule.
 - 1) Format of testing schedule in accordance with Specification Section –
CONSTRUCTION SCHEDULES.
- 2. Cooperation with testing laboratory:
 - a. Provide access to Work being tested.
 - b. Provide test samples as selected by testing laboratory.
 - c. Schedule Work so that there shall be no excessive inspection time.
 - 1) At times that an inspector is required, sufficient work shall be laid out and adequate personnel supplied so that the inspector's time shall be used to full advantage.
 - 2) If inspection costs become excessive because of poor shop or construction procedure, such excess costs will be paid for by the Owner, but deducted from the Contract Price.
 - d. Inspections and tests required by regulatory agencies shall be the responsibility of and shall be paid for by the Owner unless specified otherwise.
 - e. Inspections and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.
 - f. Test Reports:
 - 1) Distribute test reports and related instruction to insure all required re-testing and/or replacement of materials.
 - g. Payment of Testing:
 - 1) All testing shall be paid for by the Owner.
- 3. Contractor shall be backcharged for re-testing, excessive distance from the Project Site, or extra testing required because of initial failures.

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Quality Assurance/Control Submittals:
 - a. Test Reports:
 - 1) Submit four (4) copies of testing laboratory's report.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Testing Laboratory Qualifications:
 - a. In accordance with the latest Edition of ASTM E-329.
- B. Regulatory Requirements and Reference Standards:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. In accordance with regulatory agencies and appropriate ASTM Standards.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 SCHEDULES

- A. Testing Schedule at the end of this section should be used as a guide only and it is not considered a complete list. Refer to regulatory agency requirements and specific specification section for complete testing requirements.
- B. TESTING SCHEDULE
 - 1. 03 15 14 - DRILLED ANCHORS
 - a. Tension Tests.
 - 1) Paid by Owner.
 - 2. 03 20 00 - REINFORCEMENT
 - a. Rebar Material per ACI 318, CBC TABLE 1705A.2.1, CBC Sections 1903A.1, 1905A, and 1910A.
 - 1) Paid by Owner
 - b. Continuous Inspection of Welds per ACI 318, CBC TABLE 1705A.2.1, CBC Sections 1903A.8, 1905A, and 1910A.
 - 1) Paid by Owner
 - 3. 03 30 00 - CAST-IN-PLACE CONCRETE
 - a. Cement Material per ACI 318, and CBC Sections 1903A, 1905A, and 1910A.
 - 1) Paid by Owner
 - b. Aggregate Material per ACI 318.
 - 1) Paid by Owner
 - c. Concrete Mix per ACI 318. CBC Sections 1903A and 1910A.
 - 1) Paid by Owner
 - d. Concrete Strength Tests per ACI 318.
 - 1) Paid by Owner
 - e. Concrete Compression Tests per ACI 318.
 - 1) Paid by Owner
 - 4. 04 22 00 - CONCRETE MASONRY UNITS
 - a. Grout Tests/Mortar Tests per CBC Section 2105A.3.
 - 1) Paid by Owner
 - b. Continuous Inspection of Laying Block and Block Cores per THE MASONRY SOCIETY - TMS 402 and TMS 602, as set forth in Tables 3 and 4, Level 3 requirements and Chapter 21A. Testing shall be in accordance of CBC Section 2105A.
 - 1) Paid by Owner
 - c. Concrete Masonry Unit Tests per CBC Section 2105A.6.
 - 1) Paid by Owner
 - 5. 05 12 00 - STEEL AND FABRICATIONS
 - a. Steel Material per CBC Section 1705A.2.
 - 1) Paid by Owner
 - b. High Strength Bolts and installation per CBC Section 1705A, and CBC Section 1705A.2.6.
 - 1) Paid by Owner
 - c. Inspection of Shop and Field Welding per CBC Section 1705A, and CBC Section 1705A.2.5.
 - 1) Paid by Owner
 - 6. 05 30 00 - METAL DECK
 - a. Steel Material per CBC Section 1705A, and CBC Section 1705A.2.2.
 - 1) Paid by Owner
 - b. Inspection of Shop and Field Welds per CBC Section 1705A, and Table 1705A.2.1.
 - 1) Paid by Owner

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7. 06 17 33 - WOOD JOISTS
 - a. Continuous Plant Inspection for open web trusses per CBC Section 1705A.5.5.
 - 1) Paid by Owner
 8. 06 18 00 - GLUE-LAMINATED CONSTRUCTION
 - a. Continuous Plant Inspection per CBC Sections 1705A.5.4, and 1705A.10.
 - 1) Paid by Owner
 9. 09 22 16 - METAL FRAMING
 - a. Metal Stud Material.
 - 1) Paid by Owner
 - b. Metal Stud Welding.
 - 1) Paid by Owner
 10. 09 51 00 - ACOUSTICAL CEILINGS
 - a. Main and cross runners, intersection connectors and expansion devices
 - 1) Paid by Contractor
 11. DIV. 22 - PLUMBING
 - a. Non-Leaking System
 - 1) Paid by Contractor
 - b. Bacteriological Purity
 - 1) Paid by Contractor
 12. DIV. 23 - HEATING, VENTILATING AND AIR CONDITIONING
 - a. Equipment Operation
 - 1) Paid by Contractor
 - b. System Energy Balance
 - 1) Paid by Contractor
 - c. Non-Leaking Hydronic System.
 - 1) Paid by Contractor
 13. DIV. 26 - SERVICE AND DISTRIBUTION
 - a. Equipment Operation
 - 1) Paid by Contractor
 - b. Protective Systems
 - 1) Paid by Contractor
 14. DIV. 26 - LIGHTING
 - a. Equipment Operation
 - 1) Paid by Contractor
 15. DIV. 27 - MASTER CLOCK AND PUBLIC ADDRESS SYSTEM
 - a. Equipment Operation
 - 1) Paid by Contractor
 16. DIV. 28 - FIRE SPRINKLER SYSTEM
 - a. All tests required by NFPA #13.
 - 1) Paid by Contractor
 17. DIV. 28 - WET CHEMICAL FIRE SUPPRESSION SYSTEM
 - a. All tests required by NFPA #17A.
 - 1) Paid by Contractor
 18. 31 20 00 - EARTHWORK
 - a. Compaction Test
 - 1) Paid by Owner
 - b. Inspection of Excavations and Fills per CBC Table 1705A.6.
 - 1) Paid by Owner
 - c. Department of Toxic Substances Control (DTSC) Independent Testing of Imported soil
 - 1) Paid by Contractor
- C. Division of the State Architect "Statement of Structural Tests and Special "Inspections":

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1. In addition to the TESTING SCHEDULE cited above, and elsewhere within the documents, DSA requires the Contractor to schedule and manage the following tests to be performed and reported as required for this Project.
2. Failure to schedule these tests is grounds for reduction in Monthly Payment Request authorization, and may delay distribution of the Final Payment.
3. Refer to the approved DSA 103-Listing of Structural Tests and Special Inspections Form.

END OF SECTION

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all Temporary Utilities, Support Facilities, and Protection Facilities materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Shop Drawings:
 - a. Project Sign.
 - 2. Quality Assurance/Control Submittal:
 - a. Copy of Application to APCD for Dust Prevention and Control Plan.
 - b. Copy of approved Application to APCD for Dust Prevention and Control Plan.
 - c. Copy of Application to local City or County Engineer for Traffic Control.
 - d. Copy of approved Application to local City or County Engineer for Traffic Control.
 - e. Temporary Project Enclosure Plan.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CARB 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), in the area where the project is located.
 - b. CAL/OSHA California Division of Occupational Safety and Health Administration
 - c. EPA Environmental Protection Agency
- B. Dust Prevention and Control Plan:
 - 1. Prior to commencing the Work, prepare a Dust Prevention and Control Plan and obtain review and approval of the Air Pollution Control District (APCD) in the area where the project is located.
 - a. Prepare application and file with appropriate fees to APCD upon completion of Dust Prevention and Control Plan.

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2. The Dust Prevention and Control Plan shall specify the methods of control that will be utilized, demonstrate the availability of needed equipment and personnel, and identify a responsible individual who, if needed, can authorize implementation of additional measures.
 3. All construction shall comply with applicable elements of the APCD's regulations.
 4. The Dust Prevention and Control Plan shall include, but not be limited to, the following:
 - a. Contractor's name and project identification information.
 - b. Procedures and measures to be implemented, but not be limited to:
 - 1) All material excavated or graded shall be sufficiently watered to prevent excessive amounts of dust.
 - 2) During periods of high winds, all clearing, grading, earth moving, or excavation shall cease when dust control measures are unable to avoid visible plumes.
 - 3) All dust producing material transported off site shall be either sufficiently watered or securely covered to prevent excessive amounts of dust.
 - 4) The area disturbed by clearing, earth moving, or excavation activities shall be minimized at all times.
 - 5) All watering of areas shall be only to the extent required to keep the soil particles in a moist condition and not to the extent that erosion of surface soil occurs.
 - 6) To control general fugitive dust, on-site vehicle speed shall be limited to 15 mph.
 - 7) All areas with vehicle traffic shall be watered periodically for stabilization of dust emissions.
 - 8) Periodically streets adjacent to the project site shall be cleaned as required to remove silts which may have accumulated from construction activities.
- C. Traffic Control Plan:
1. Prior to commencing the Work, prepare a Traffic Control Plan and obtain approval of the local City or County Engineer in the area where the project is located.
 - a. Prepare application and file with appropriate fees to the local City or County Engineer upon completion of Traffic Control Plan.
 2. The Traffic Control Plan shall include information on construction timing and phasing and proposed methods of alleviating potential hazardous and/or inconvenient conditions. Such methods can include, but are not limited to, the use of flagmen, barricades, signs, warning lights, detours, phased lane closures, coordination with adjacent property owners, and coordination with law enforcement, fire protection and other emergency service agencies.
- D. Temporary Project Enclosure Plan:
1. Prior to commencing the Work, prepare a Temporary Project Enclosure Plan indicating the protection of people, animals, and partial and fully completed work until occupancy by the Owner.
 2. Identify temporary egress from existing occupied facilities and as required by authorities having jurisdiction.
 3. The Temporary Project Enclosure Plan shall include, but not be limited to, the following:
 - a. Contractor's name and project identification information.
 - b. Indicate the duration of the proposed measures based on the completion of the work as a whole and if any phases of work are identified.
 - c. Indicate proposed temporary fencing and potential exit and entry paths.
 - 1) Show gate and door locations and indicate who has access.
 - d. Indicate proposed temporary wall location(s) and potential exit and entry paths.
 - 1) Show door location(s) and indicate who has access.
 - e. Indicate type of material used for temporary fencing, walls, gates, and doors.
 - f. Indicate proposed temporary roads and paved areas.
 - g. Indicate proposed temporary offices and storage areas.

- E. Copy of approved Fire Protection Program:
1. Contractor shall be responsible for the development, implementation, and maintenance of a written plan establishing a fire prevention program at the project site applicable throughout all phases of the construction, repair, alteration, or demolition work in accordance with CFC Chapter 33, Section 3308 and sub-sections.
 2. It is the Contractor's responsibility to contact local Fire Authority to discuss the plan.
 - a. A copy of the report should be made available to the Project Inspector and local Fire Authority.
 3. Approval Required: Prior to commencing the Work, prepare a Fire Protection Program and obtain review and approval from the local Fire Authority in the area where the project is located.
 4. Plan shall address at a minimum:
 - a. Each phase of the construction, repair, alteration, or demolition work.
 - b. Designate responsible program superintendent in accordance with CFC 3308.2.
 - c. Duties of staff.
 - d. Staff training requirements.
 - e. Prefire plans.
 - f. Fire protection devices.
 - g. Hot work operations.
 - h. Impairment of fire protection systems.
 - i. Temporary covering of fire protection devices.

1.4 PROJECT CONDITIONS

A. Environmental Requirements:

1. Heating and Cooling:
 - a. Provide temporary heating and cooling required by construction activities for curing, acclimating the building or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed, and is maintained prior, during and after the installation in accordance with the exterior or interior building materials temperature and humidity guidelines.
 - 1) Do not use heating units that contribute moisture to the enclosed spaces under construction.
2. Ventilation and Humidity Control:
 - a. Provide temporary ventilation required by construction activities for curing, acclimating the building or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 - 1) Exterior Moisture Control:
 - a) Perform the installation of all exterior building cladding only after the substrate to which they are being applied is dry and ready to receive them. Do not apply any cladding if it will trap moisture inside a wall or roof cavity (i.e. insulation that has become wet for whatever reasons).
 - 2) Interior Moisture Control:
 - a) Perform the installation of all interior moisture sensitive building materials only after the building or space is acclimated to the final environmental conditions under which the building is to be operated in accordance within the Owner's humidity control guidelines.

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- b. Maintain a consistent humidity in accordance with the guidelines for those materials in the space at least seven (7) days prior to installation of any moisture sensitive materials (i.e. Veneer Plaster, Gypsum Board, Ceiling Tiles, Wood Sensitive Floors, other Flooring sensitive to moisture levels, Interior Painting, etc.).
 - c. Maintain the same levels or temperature and humidity during the installation of those materials, and after the installation of those materials until the building's own mechanical systems can be turned on to maintain the facility within the Owner's temperature and humidity control guidelines.
 - d. Replace any materials that have become wet and damaged due to the Contractor not properly protecting installed building materials at no additional cost to the Owner.
 - 3. Dust control:
 - a. Perform work in a manner as to minimize the spread of dust and flying particles.
 - b. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors and concurrent performance of other on-site work.
 - c. Temporarily cover mechanical equipment and ductwork openings to prevent the entry of construction dust and debris.
 - 4. Burning: No burning will be allowed on-site.
 - 5. Noise Control:
 - a. Stationary noise sources shall be of a low-noise emission design, consistent with the best available noise reduction technology.
 - b. The hours of operation of noise-generating equipment shall be restricted to 6:00 a.m. to 7:00 p.m. Monday through Friday, and to 8:00 a.m. to 6:00 p.m. on Saturday and Sunday.
 - c. Mufflers shall be required on all gas and diesel-powered equipment.
- B. Existing Conditions:
 - 1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 - 2. Cultural Resources:
 - a. The Contractor is advised of the possibility that cultural resources may be discovered during project activities.
 - b. If any cultural or paleontological materials are uncovered during project activities, work in the area or any area reasonably suspected to overlie adjacent remains shall be stopped and the Architect advised of the discovery. The Architect will notify the appropriate agency and the work shall remain stopped until professional cultural resources evaluation and/or data recovery excavation can be planned and implemented. Appropriate measures to protect remains from accidents, looting, and vandalism shall be implemented immediately on discovery.
 - c. If human remains are discovered, the work in the area or any area reasonably suspected to overlie adjacent remains shall be stopped and the County Coroner and the Architect shall be notified immediately. Appropriate measures to protect remains from accidents, looting, and vandalism shall be implemented immediately on discovery. The work shall remain stopped until professional cultural resources evaluation and/or recovery excavation can be planned and implemented.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Fire Protection During Construction:

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1. Provide Temporary Fire Protection per CFC Chapter 33 during demolition and construction.
- B. Field Offices:
 1. General Note: Provide one (1) 2A:10B:C Wall Surface Mounted Fire Extinguisher in each field office as a minimum per the CSFM.
 2. Contractor's Field Office:
 - a. Size: Nominal 8 feet wide minimum, approximately 96 square feet minimum.
 - b. Equipment:
 - 1) Table for review of Drawings.
 - 2) Files, rack and shelves as required to store Contract Drawings and Project Record Drawings in a neat, orderly manner.
 - 3) One copy of each code listed in Specification Section - REGULATORY REQUIREMENTS.
 - 4) Telephone.
 - 5) Internet Connection.
 - 6) Plain Paper Copier / FAX Machine.
 - c. Facilities:
 - 1) Adequate light and power.
 - 2) Adequate heating, ventilation and air conditioning.
 - d. Control and Access:
 - 1) Door shall be lockable and key shall be supplied to Architect and access shall be limited to Owner, Architect, Inspector and Contractor.
 - e. All of the above items shall be subject to Architect's approval.
 3. Contractor's Field Office:
 - a. Size: Nominal 8 feet wide minimum, approximately 200 square feet minimum.
 - b. Equipment:
 - 1) Table for review of Drawings.
 - 2) Files, rack and shelves as required to store Contract Drawings and Project Record Drawings in a neat, orderly manner.
 - 3) One copy of each code listed in Specification Section - REGULATORY REQUIREMENTS.
 - 4) Telephone.
 - 5) Internet Connection.
 - 6) Plain Paper Copier / FAX Machine.
 - c. Facilities:
 - 1) Adequate light and power.
 - 2) Adequate heating, ventilation and air conditioning.
 - d. Control and Access:
 - 1) Door shall be lockable and key shall be supplied to Architect and access shall be limited to Owner, Architect, Inspector and Contractor.
 - e. All of the above items shall be subject to Architect's approval.
 4. Contractor's Field Office:
 - a. Size: Nominal 10 feet wide minimum, approximately 400 square feet minimum (half of this office is to be reserved for a conference room for job site meetings).
 - b. Equipment:
 - 1) Table for review of Drawings.
 - 2) Files, rack and shelves as required to store Contract Drawings and Project Record Drawings in a neat, orderly manner.
 - 3) One copy of each code listed in Specification Section - REGULATORY REQUIREMENTS.
 - 4) Telephone.
 - 5) Internet Connection.
 - 6) Plain Paper Copier / FAX Machine.
 - 7) Conference room table and chairs for at least 10 people.

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- c. Facilities:
 - 1) Adequate light and power.
 - 2) Adequate heating, ventilation and air conditioning.
 - d. Control and Access:
 - 1) Door shall be lockable and key shall be supplied to Architect and access shall be limited to Owner, Architect, Inspector and Contractor.
 - e. All of the above items shall be subject to Architect's approval.
5. Project Inspector's Field Office:
- a. Size: Nominal 8 feet wide minimum, approximately 96 square feet minimum.
 - b. Equipment:
 - 1) Table for review of Drawings.
 - 2) Files, rack and shelves as required to store Contract Drawings and Project Record Drawings in a neat, orderly manner.
 - 3) Space for one copy of each code listed in Specification Section - REGULATORY REQUIREMENTS.
 - 4) Telephone.
 - 5) Internet Connection.
 - 6) Plain Paper Copier / FAX Machine.
 - c. Facilities:
 - 1) Adequate light and power.
 - 2) Adequate heating, ventilation and air conditioning.
 - d. Control and Access:
 - 1) Door shall be lockable and key shall be supplied to Architect and access shall be limited to Owner, Architect, Inspector and Contractor.
 - e. All of the above items shall be subject to Architect's approval.
6. Project Inspector's Field Office:
- a. Size: Nominal 8 feet wide minimum, approximately 200 square feet minimum (sized for one (1) Owner's Inspector, and a desk for the Architects use).
 - b. Equipment:
 - 1) Two (2) 48" x 96" layout tables for review of the drawings by each Inspector.
 - 2) Two (2) 30" x 60" standard desks with two drawers on one side of each desk (the second desk will be used by the Architect when visiting the site).
 - 3) Two (2) secretarial task chairs with five point rolling bases.
 - 4) Two (2) 4-drawer legal size, full suspension, lockable file cabinets.
 - 5) Two (2) 60" high x 36" wide x 12" deep free standing bookcases with four (4) adjustable shelves for each bookcase.
 - 6) One (1) 12-capacity rolling, vertical "Plan Holds" with adjustable brackets for 30" x 42" wide drawings.
 - 7) Two (2) 36" x 48" tackboards mounted to walls as directed by the Owner's Inspector.
 - 8) Two (2) drafting stools.
 - 9) Space for one copy of each code listed in Specification Section - REGULATORY REQUIREMENTS.
 - 10) One telephone.
 - 11) Internet Connection.
 - 12) One Plain Paper Copier / FAX Machine.
 - c. Facilities:
 - 1) Adequate light and power.
 - 2) Adequate heating, ventilation and air conditioning (ducted central HVAC).
 - 3) Electric water cooler with both hot and cold water.
 - d. Control and Access:
 - 1) Door shall be lockable and key shall be supplied to Architect and access shall be limited to Owner, Architect, Inspectors and Contractor.

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- e. All of the above items shall be subject to Architect's approval.
- 7. Project Inspector's Field Office:
 - a. Size: Nominal 10 feet wide minimum, approximately 400 square feet minimum (sized for two (2) Owner's Inspectors, and a desk for the Architects use).
 - b. Equipment:
 - 1) Three (3) 48" x 96" layout tables for review of the drawings by each Inspector.
 - 2) Three (3) 30" x 60" standard desks with two drawers on one side of each desk (the third desk will be used by the Architect when visiting the site).
 - 3) Three (3) secretarial task chairs with five point rolling bases.
 - 4) Three (3) 4-drawer legal size, full suspension, lockable file cabinets.
 - 5) Three (3) 60" high x 36" wide x 12" deep free standing bookcases with four (4) adjustable shelves for each bookcase.
 - 6) Three (3) 12-capacity rolling, vertical "Plan Holds" with adjustable brackets for 30" x 42" wide drawings.
 - 7) Three (3) 36" x 48" tackboards mounted to walls as directed by the Owner's Inspector.
 - 8) Three (3) drafting stools.
 - 9) Space for one copy of each code listed in Specification Section - REGULATORY REQUIREMENTS.
 - 10) Two telephones.
 - 11) Internet Connection.
 - 12) One Plain Paper Copier / FAX Machine.
 - c. Facilities:
 - 1) Adequate light and power.
 - 2) Adequate heating, ventilation and air conditioning (ducted central HVAC).
 - 3) Electric water cooler with both hot and cold water.
 - d. Control and Access:
 - 1) Door shall be lockable and key shall be supplied to Architect and access shall be limited to Owner, Architect, Inspectors and Contractor.
 - e. All of the above items shall be subject to Architect's approval.
- 8. Project Inspector's Field Office:
 - a. Size: Nominal 12 feet wide minimum, approximately 675 square feet minimum (sized for four (4) Owner's Inspectors, and a desk for the Architects use).
 - b. Equipment:
 - 1) Four (4) 48" x 96" layout tables for review of the drawings by each Inspector.
 - 2) Five (5) 30" x 60" standard desks with two drawers on one side of each desk (the fifth desk will be used by the Architect when visiting the site).
 - 3) Five (5) secretarial task chairs with five point rolling bases.
 - 4) Two (2) 4-drawer legal size, full suspension, lockable file cabinets.
 - 5) Two (2) 60" high x 36" wide x 12" deep free standing bookcases with four (4) adjustable shelves for each bookcase.
 - 6) Four (4) 12-capacity rolling, vertical "Plan Holds" with adjustable brackets for 30" x 42" wide drawings.
 - 7) Two (2) 36" x 60" folding tables and twelve (12) folding chairs.
 - 8) Five (5) 36" x 48" tackboards mounted to walls as directed by the Owner's Inspector.
 - 9) Five (5) drafting stools.
 - 10) Space for one copy of each code listed in Specification Section - REGULATORY REQUIREMENTS.
 - 11) Four telephones.
 - 12) Internet Connection.
 - 13) One Plain Paper Copier / FAX Machine.

- c. Facilities:
 - 1) Adequate light and power.
 - 2) Adequate heating, ventilation and air conditioning (ducted central HVAC).
 - 3) Electric water cooler with both hot and cold water.
 - d. Control and Access:
 - 1) Door shall be lockable and key shall be supplied to Architect and access shall be limited to Owner, Architect, Inspectors and Contractor.
 - e. All of the above items shall be subject to Architect's approval.
- C. Project Sign:
- 1. The Contractor shall furnish and erect at location as directed by the Architect one sign board approximately 4 feet x 8 feet, fabricated of 3/4 inch exterior grade plywood with a sturdy frame attached to 4 inch x 4 inch x 14 foot redwood posts set 4 feet in the ground minimum, and substantially braced.
 - 2. The sign to be painted on signboard shall be of design in 4 colors as directed by the Architect.
 - 3. Lettering shall be of style shown, neatly executed by a skilled sign painter.
 - 4. The information to be lettered on sign shall be as furnished by the Architect.
 - a. Sign will include the names of the [**Prime**] Contractor(s), Owner, Architect, and the project designation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 - 1. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 - 2. Execution of work under this specification section shall constitute acceptance of existing conditions.
 - 3. Obtain all necessary permits and authorizations by regulatory agencies required to perform the work under this section.

3.2 PREPARATION

- A. Coordination:
 - 1. Before proceeding, verify plans match existing conditions.
 - 2. Coordinate work under this specification with work specified under other sections to ensure proper and adequate interface of work.
- B. Protection:
 - 1. The Contractor shall verify and protect existing landscaping, asphalt area, concrete walkways, and other site improvements to remain on the site before proceeding with the Work.
 - 2. Prior to starting Work, hose bibbs, utility lines, etc., to be abandoned and removed within the construction area shall be stubbed off outside the limits of construction.
 - 3. Verify and protect utilities to remain within the construction area and provide special construction for their protection.

3.3 IMPLEMENTATION

- A. General:
 - 1. Perform Work and provide and maintain Temporary Utilities and Temporary Facilities in accordance with the requirements of all regulatory authorities having jurisdiction.

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2. Contractors shall cooperate with other contractors and the Owner in the use of the site, Temporary Utilities, Temporary Facilities and shall adjust their operations to maintain harmonious relations and uninterrupted progress of the Work.
 3. The Contractor shall assume all responsibility for the provision and maintenance of these Temporary Utilities and Temporary Facilities and for the provisions of public safety where the operations under this Contract interface with public areas.
 4. Relocate and modify Temporary Utilities and Temporary Facilities, as required by progress of the Work.
 5. Remove Temporary Utilities and Temporary Facilities upon completion of the Project.
 6. Temporary Utilities and Temporary Facilities are to be provided and maintained from commencement of Work until final acceptance.
 - a. The Contractor shall pay all charges required of him for the duration of the project, including a [1][2][3] month period following the date of the Notice of Substantial Completion.
- B. Temporary Utilities:
1. Install temporary service or connect to existing service.
 - a. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
 - 1) Minimum forty-eight (48) hours prior notice to any interruption.
 2. Sewers:
 - a. Provide temporary service to remove effluent lawfully.
 3. Storm Drainage:
 - a. Provide temporary service as necessary to remove storm water. Work shall be performed in accordance with the requirements of the Storm Water Pollution Prevention Plan (SWPPP), if any. If no SWPPP is required, then follow local authorities having jurisdiction requirements.
 4. Water:
 - a. The Contractor will arrange and pay for all water supply for all purposes of construction at a location to be designated at the site. Extensions within the site shall be provided by the Contractor and maintained in a safe and efficient manner.
 - b. The Owner will pay for all water supply for all purposes of construction at a location to be designated at the site. Extensions within the site shall be provided by the Contractor and maintained in a safe and efficient manner.
 5. Electrical:
 - a. The Contractor shall provide and pay for all electrical facilities and services for all purposes of power and lighting for construction at a location to be designated at the site. Extensions within the site shall be provided by the Contractor and maintained in a safe and efficient manner.
 - 1) The Contractor shall pay for cost of electrical energy required in connection with the testing of such equipment as generators, transformers, power machinery, and similar equipment installed in the work.
 - b. The Owner will pay and the Contractor shall provide for all electrical facilities and services for all purposes of power and lighting for construction at a location to be designated at the site. Extensions within the site shall be provided by the Contractor and maintained in a safe and efficient manner.
 - 1) The Contractor shall pay for cost of electrical energy required in connection with the testing of such equipment as generators, transformers, power machinery, and similar equipment installed in the work.
 - c. The Contractor will provide electrical energy to all subcontractors as required on or about the premises.
 - d. The Contractor will provide power outlets having adequate electrical characteristics and lighting of adequate intensity for the use of other contractors within reasonable distances from their needs and within a reasonable period of time after the other contractors have requested them.

6. Telephone:
 - a. The Contractor shall provide and pay for all telephone service and telephone equipment in the Field Offices until completion of the Work.
 - 1) Provide an additional dedicated phone line for modem/network connection in the Project Inspector's Field Office for use by the Architect's representative.
 7. Heating:
 - a. Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity.
 - b. Select UL or FM approved equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1) Except where use of the permanent heating system is authorized, provide temporary units that do not introduce moisture into the newly constructed building spaces.
 - 2) Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.
 - c. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
- C. Temporary Facilities:
1. Support Facilities:
 - a. Offices and Storage:
 - 1) Provide temporary offices and storage facilities located within the construction area.
 - 2) Protect materials, construction work and their operations from weather, vandalism, and theft.
 - b. Sanitary Facilities:
 - 1) Provide adequate, self-contained toilets as required for all persons employed on the Project.
 - 2) In no case shall the permanent plumbing fixtures of the Project be used for this purpose.
 - c. Temporary Roads and Paved Areas:
 - 1) Construct and maintain temporary roads and paved areas adequate for construction operations and fire protection during construction.
 - d. Traffic Controls:
 - 1) Implement procedures and measures outlined in the local jurisdiction's approved Traffic Control Plan.
 - 2) Maintain access for fire-fighting equipment and access to fire hydrants.
 - 3) Conduct work and comply with applicable building codes and regulations regarding the use of public streets and sidewalks and the proper barricading and lighting of public thoroughfares surrounding the construction activities.
 - 4) Provide and maintain access as required to perform work.
 - 5) Repair all damage as a result of work performed on the project to adjacent roads, streets, drives and walks. Restore to condition as good as existed at commencement of the Work.
 - e. Project Sign:
 - 1) Install project sign as submitted and approved.
 - 2) No other signs will be allowed on the project.
 - f. Existing Elevator Use:
 - 1) Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to the Owner.
 - 2) Do not load elevators beyond their rated weight capacity.
 - g. Existing Stair Use:

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- 1) Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to the Owner.
2. Protection Facilities:
 - a. Existing Facilities:
 - 1) Protect existing vegetation, equipment, structures, utilities, and other improvements at project site and on adjacent properties, except those indicated to be removed or altered. Damage occurring during the course of construction shall be repaired to condition at the start of the Work.
 - b. Environmental:
 - 1) Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - c. Project Enclosure:
 - 1) Implement procedures and measures outlined in Temporary Project Enclosure Plan.
 - 2) Project enclosure shall protect materials, construction work, and operations from vandalism, theft, and to exclude the intrusion of the public into the construction area.
 - 3) Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by the Owner from fumes and noise.
 - 4) Maintain security by limiting number of keys and restricting distribution to authorized personnel.

3.4 CLEANING

A. Clean in accordance with Specification Section – PROJECT CLOSEOUT.

1. At all times, keep the premises free from accumulations of waste materials or rubbish caused by employees or the Work.
2. Clean all soiled surfaces to remain immediately.
3. At the completion of the Work, remove all rubbish from and about the building and all tools, scaffolding, and surplus materials and shall leave the Work "broom clean" or its equivalent.

END OF SECTION

SECTION 01 64 00 – OWNER-FURNISHED ITEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all materials, labor, equipment, and services necessary to prepare for installation for those items, noted or scheduled within the Contract Documents, indicated as follows:
 - a. CFCI - Contractor Furnished, Contractor Installed
 - b. OFCI - Owner Furnished, Contractor Installed
 - c. OFOI - Owner Furnished, Owner Installed
 - d. OFVI - Owner Furnished, Vendor Installed
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

- A. Unless otherwise defined in the GENERAL CONDITIONS, the following definitions apply for this project:
 - 1. CFCI: CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
 - a. When and if the indication "CFCI" is noted on the drawings or listed in the specifications, such items are shown or listed for information and will be furnished by and installed by the Contractor. Such a designation is listed only for clarity, in order to set the item(s) apart from the OFCI, OFOI, and OFVI related item(s).
 - b. All item(s) shown or listed in the drawings and specifications without any indication are in the Contract and are part of the Work unless specifically noted otherwise.
 - 2. OFCI: OWNER FURNISHED, CONTRACTOR INSTALLED
 - a. When and if the indication "OFCI" is noted on the drawings or listed in the specifications, such item(s) are shown or listed for information and will be furnished by Owner and installed by the Contractor. The Contractor shall coordinate and verify all dimensions and details necessary for the proper installation.
 - 3. OFOI: OWNER FURNISHED, OWNER INSTALLED
 - a. When and if the indication "OFOI" is noted on the drawings or listed in the specifications, such item(s) are shown or listed for the purpose of general information and will be furnished and installed by Owner. The Contractor shall coordinate and verify all dimensions and details necessary for proper installation.
 - 4. OFVI: OWNER FURNISHED, VENDOR INSTALLED
 - a. When and if the indication "OFVI" is noted on the drawings or listed in the specifications, such item(s) are shown or listed for information and will be furnished by the Owner and installed by the Vendor. The Contractor shall coordinate and facilitate all work to be completed by the Vendors.

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:

1. Coordination Drawings:
 - a. Submit installer's coordination drawings or other documents indicating the work of this section with that of related work of other sections for proper interface of the completed work. Installer shall coordinate and obtain approvals from the work of other related sections prior to submitting to the Architect.
 - b. The Owner will provide Product Data, Shop Drawings, Piping and Wiring Diagrams, Catalog Data Sheets for any items provided under this Specification Section.
2. Closeout Submittals in accordance with Specification Sections in Division One:
 - a. Project Record Documents in accordance with Specification Section - PROJECT DOCUMENTS.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CARB 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). Regulatory changes may affect the formulation, availability, or use of the specified coatings. Confirm availability of coatings to be used prior to use, and notify the Architect of any recent changes in the Local California Air District Standards where the Project is located, that may have occurred after the preparation of this specification section.

B. Meetings:

1. Progress Meetings: Scheduled by the Contractor for the proper performance of the work.
 - a. Minimum agenda shall be to review the work progress; discuss field observations, problems, and decisions; identification of any potential problems which may impede planned progress; corrective measures to regain projected schedules; and maintenance of quality and work standards in accordance with manufacturer's warranty requirements.
2. Final Inspection: Scheduled by the Contractor upon proper completion of the work.
 - a. Minimum agenda shall be a walkover inspection to identify problems which may impede the issuance of any warranties or guarantees, and discussion of maintaining the work until substantial completion notice for the project is filed.
3. Participants (or designated representative of) invited to attend each of the above meetings shall be as follows:
 - a. Contractor.
 - b. Owner.
 - c. Architect.
 - d. Installer.
 - e. Material Manufacturer(s).
 - f. Subcontractors, as appropriate (including any accessory subcontractors).

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, shipping, handling, and unloading:

1. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage. Damaged products will not be accepted. Contractor shall inspect prior to unloading, for any damaged goods, and if OK, will allow unloading and be responsible for the goods.

B. Acceptance at Site:

1. The Contractor shall accept delivery of any items and the responsibility for all items to be furnished to him by the Owner.

C. Storage and protection:

1. Owner Furnished Equipment: The Owner will coordinate and inform the Contractor as to delivery dates for Owner Furnished Equipment to the Project Site. The Contractor shall be responsible for unloading, uncrating, and protecting such equipment.
2. When only a supporting device, or sub-assembly is to be installed by the Contractor the Owner shall provide only that portion and shall store and safeguard those portions to be installed later by others.
3. All products shall be protected, handled, and stored in complete compliance with the manufacturer's printed instructions to protect the Owner from warranty infringements or loss of the full function of the item specified.

1.6 PROJECT CONDITIONS OR SITE CONDITIONS

A. Existing Conditions:

1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
2. Examine all preparatory work to determine its suitability and completeness. Notify the responsible Contractor of any deficiencies which must be corrected prior to installation.
3. Be satisfied that all conditions affecting installation, operation or function are suitable for installation of the items scheduled.
4. After installation, and acceptance by the inspector and the Architect, the Contractor shall provide protective guards, covers or barricades as required by the manufacturer.
5. The Contractor shall promptly repair, refurbish, or replace items damaged by his operations to a condition satisfactory to the Owners representatives and at no cost to the Owner.

1.7 WARRANTY

1. The Contractor shall provide access to the installed items or prepared substrates for the inspection of the manufacturers representatives, for the purpose of affirming the warranties scheduled.
2. All work shall be performed in full accordance with the manufacturers warranty requirements and all governing codes.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordination:

1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
 - a. Prepare all substrate blocking as required by the items Furnished By Owner.
 - b. Prepare all wiring and piping connections as required by the items Furnished By Owner.

B. Protection:

1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.

- C. Surface preparation:
1. Prepare surface in accordance with manufacturer's instructions and recommendations.
 2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond or installation of materials specified within the Contract Documents.

3.2 INSTALLATION

- A. General:
1. In accordance with manufacturer's instructions and recommendations unless specifically noted otherwise.
 2. In accordance with approved submittals.
 3. In accordance with Regulatory Requirements.
 4. Set plumb, level, and square.
- B. Layout:
1. Lines shall be straight and true.
- C. Material and Equipment to be installed:
1. All items so noted or scheduled to be OFCI shall be unloaded, completely installed and placed in operable condition under this Contract.

3.3 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
1. Clean any soiled surfaces at the end of each day, minimum.
 2. In accordance with manufacturer's instructions and recommendations.

3.4 SCHEDULES

- A. This schedule is provided for the convenience of the General Contractor for items not scheduled elsewhere on the drawings or in the Specification Sections. Refer to Drawings for additional items not listed below:

1. SITE EQUIPMENT	STATUS
a. Building Plaque (Bronze – 24" x 18")	OFCI
1) Mounting shall be by Bosses and Studs into concrete Sign/Wall.	
b. Playfield Equipment	OFOI
2. BUILDING A STATUS	
a. Knox Box, Model #3200 7 high x 7 recessed	OFCI
b. Refrigerator, Under Counter	OFOI
3. BUILDING B STATUS	
a. Projection Screen, Motorized with Keyed switches	OFCI
b. Electric Kiln	OFOI
c. Vending Machines	OFOI
4. BUILDING D STATUS	
a. Roll Paper Dispenser	OFOI

END OF SECTION

SECTION 01 73 29 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary for cutting and patching existing materials, accessories and other related items necessary to remodel the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

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

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Coordination Drawings:
 - a. Submit any installer's coordination drawings indicating the work of this section with that of related work of other sections for proper interface of the completed work. Installer shall coordinate and obtain approvals from the work of other related sections prior to submitting to the Architect.

1.4 QUALITY ASSURANCE

- A. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades.
 - 1. Review areas of potential interference and conflict.
 - 2. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- C. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

- E. The Contractor shall do all cutting, fitting or patching of existing construction and his work as may be required to make the several parts come together properly and ready to receive or be received by work of other contractors as shown, or reasonably implied by the drawings and specifications for the completed structure. All work shall be as directed by the Architect to achieve the intended work and degree of finish shown.
- F. Any cost caused by defective or ill-timed work shall be borne by the party responsible therefor.

1.5 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 FIELD QUALITY CONTROL

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill. **Do not overcut concrete corners** – hand chip all corners to prevent over-cutting lines. Cut any masonry pavers at grout lines, and **don't overcut** into adjacent brick that is to remain.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Grinding and Sandblasting: Where grinding and sandblasting is required of existing construction, perform in accordance with industry standards for proper preparation of new construction or finishes.
- D. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. All hard paving and walk replacement shall be flush with adjacent existing construction. Compact existing subgrade so that there is no settling of adjacent horizontal surfaces greater than 1/4", and that all surfaces are ADA compliant.
 - b. When altering surfaces in brick paving, match nearby adjacent horizontal concrete surfaces in color and texture. Take care to protect adjacent brick surfaces from concrete slurry and finishing operations. Clean exposed surfaces of brick immediately so that no signs of adjacent concrete work is seen.
 - c. Match existing adjacent exposed aggregate concrete paving (color and texture) when construction is proposed for areas paved with exposed aggregate concrete.
 - d. Match existing adjacent colored concrete paving (color and texture) when construction is proposed for areas paved with colored concrete.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

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5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- E. Insert specific installation requirements if not specified elsewhere. Specific installation requirements are better specified in individual Sections.

END OF SECTION

SECTION 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. Requirements governing execution of the work including, but not limited to, the following:
 - a. Salvaging non-hazardous demolition waste.
 - b. Recycling non-hazardous construction and demolition waste.
 - c. Disposing of non-hazardous construction and demolition waste.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS
 - 2. DIVISION 01 SPECIFICATION SECTIONS
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, modernization, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition and site clearing operations.
- C. Disposal: Removal off-site of construction and demolition waste and subsequent sale, recycling, reuse, or deposit in landfill acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of construction or demolition waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of construction or demolition waste and subsequent sale or reuse in another facility.

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements
 - 1. General:
 - a. Achieve end-of-project rate for salvage/recycling of minimum [65][75][90] percent by weight of total non-hazardous construction and demolition waste generated by the Work.
 - b. Practice efficient waste management in the use of materials in the course of the Work.
 - c. Use all reasonable means to divert construction demolition waste from landfills and incinerators.

1.4 SUBMITTALS

- A. Submit in accordance with Specification Section – SUBMITTAL PROCEDURES:
 - 1. Quality Assurance/Control Submittal:
 - a. Waste Management Plan.

b. Waste Management Progress Reports.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. In accordance with Specification Section - REGULATORY REQUIREMENTS and the following:
 - a. CARB Materials and equipment used for this project shall comply with the current applicable regulations of the California Air Resources Board and the Environmental Protection Agency (EPA), in the area where the project is located.
 - b. CAL/OSHA California Division of Occupational Safety and Health Administration.
 - c. CF County of Fresno, codes and ordinances.
 - d. EPA Environmental Protection Agency.

B. Waste Management Plan:

1. Prior to commencing the Work, submit Waste Management Plan. The Plan must include, but not limited to, the following:
 - a. Contractor's name and project identification information.
 - b. Procedures to be implemented.
 - c. Materials to be salvaged, recycled, or disposed.
 - d. Estimated quantities of material broken down by material categories.
 - e. Names and locations of entities who receive salvaged and recycled materials.
 - f. Tonnage calculations that demonstrate that the Contractor will salvage, re-use, or recycle the minimum percentage by weight of the construction and demolition waste materials generated by the Work.

C. Waste Management Progress Reports:

1. Submit the Report with each application for progress payment.
 - a. Failure to submit the Report and it supporting documentation can render the application for progress payment incomplete and delay the progress payment.
2. Each Report must include, but not limited to, the following:
 - a. List of material categories.
 - b. Weight quantity of waste by material category.
 - c. Weight quantity of waste salvaged.
 - d. Weight quantity of waste recycled.
 - e. Total weight quantity of salvaged and recycled waste by material category.
 - f. Weight percentage of waste salvaged and recycled by material category.
 - g. Include manifests, weight tickets, receipts, and invoices specifically identifying the salvaged, reused, and recycled materials.
 - h. Signature line for Contractor.

D. Meetings:

1. Pre- Demolition.....Schedule prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems, which may impede the proper disposal of materials.
 - c. Review areas where waste and recycle bins will be located.
 - d. Review where salvaged materials will be stored.
 - e. Review demolition waste disposal and material recycling procedures and environmental goals per Waste Management Plan with all subcontractors and waste haulers.
2. Progress:.....Scheduled by the Contactor during the performance of the work.
 - a. Review for maintaining proper procedures.
 - b. Inspect and identify any problems and acceptable corrective measures.
3. Completion:.....Scheduled by the Contactor upon proper completion of the work.

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- a. Inspect and identify any problems.
- b. Submit final Progress Report summarizing total construction and demolition waste weights, percentages salvaged, recycled, and disposed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Cleaning, handling, and packing:
 - 1. Salvaged Items shall be handled in such a manner as to assure that they are free from damage.
 - 2. Salvaged Items shall be cleaned and packed or cleaned and palleted before off-site transport.
- B. Storage and protection
 - 1. Salvaged Items shall be stored in a dry, protected area prior to transport.
 - 2. Cover with protective waterproof covering providing for adequate air circulation and ventilation.

1.7 PROJECT CONDITIONS

- A. Environmental requirements;
 - 1. Comply with federal, state, and local regulations pertaining to solid waste, recycling, chemical waste, sanitary waste, and noise pollution.
 - 2. Perform work in a manner as to minimize the spread of dust and flying particles.
 - 3. No burning will be allowed on-site.
- B. Existing conditions:
 - 1. Examine project site and building(s) and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 - 2. Conduct work so as not to interfere unnecessarily with adjacent buildings, roads, streets, drives, and walks.
 - a. Do not close or obstruct streets, alleys, walks, or passageways without permission from authorities having jurisdiction and coordinating same with immediate neighbors whose business operation may be affected.
 - b. Safety measures shall be taken to insure an uninterrupted flow of traffic around the site as required by local Police and Fire Departments.
 - 3. Storage or sale of removed items on-site is not permitted.
 - 4. It is not expected that hazardous materials will be encountered in the Work.
 - a. Hazardous materials will be removed and disposed of by Owner prior to start of the Work.
 - b. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
 - 5. Hazardous materials are present in buildings and structures to be selectively demolished. The Owner has prepared a report for the Contractor to review and use.
 - a. Hazardous material remediation is specified in Specification Section -
HAZARDOUS MATERIAL PROCEDURES.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish all materials, tools, equipment, facilities, and services as required for performing the construction and demolition waste disposal work.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of conditions:
 - 1. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 - 2. Execution of work under this specification section shall constitute acceptance of existing conditions.
 - 3. Obtain all necessary permits and authorizations by regulatory agencies required to perform the Work under this Section.

3.2 PREPARATION

- A. Coordination:
 - 1. Before proceeding, verify plans match existing conditions.
 - 2. Review documents of existing construction provided by Owner against existing conditions.
 - 3. If conflicts are encountered, report it to the Architect. Then prepare recommendation(s) for correction and submit to Architect for review.
 - 4. Coordinate work under this specification section with work specified under other sections.
- B. Protection:
 - 1. Property:
 - a. Provide temporary weather protection to prevent damage to salvage and recycled items.
 - b. All damage inflicted on public and private property and the property of the Owner shall be repaired or restored to the original condition prior to the start of this Work. All repair or replacement work shall be done at no additional cost to the owner.

3.3 IMPLEMENTATION

- A. General:
 - 1. Implement waste management plan as submitted.
 - 2. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the contract.
 - 3. Designate and label specific areas on project site necessary for separating materials that are to be salvaged, recycled, reused, and donated.
- B. Demolition Waste:
 - 1. Salvaged items for delivery to Owner or other entity:
 - a. Clean salvaged items.
 - b. Pack or crate items after cleaning. Identify contents of containers.
 - c. Store items in a secure area until pick-up or delivery to Owner.
 - d. Transport item to Owner's storage area [on-site][off-site][list address].
 - e. Protect items from damage during transport and storage.

2. Salvaged items for reuse in the work:
 - a. Clean salvaged items.
 - b. Store items in a secure and dry area until ready for installation.
3. Recyclable materials:
 - a. Prepare and maintain recyclable waste materials according to recycling facility requirements.
 - b. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
 - c. Separate recyclable demolition waste from other waste materials. Separate recyclable waste by material type at project site to the maximum extent practical according to approved waste management plan.
 - d. Separate recyclable demolition waste from other waste materials. All recyclables may be co-mingled into one bin and separated off-site at the appropriate recycling facility.
 - 1) Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from the project site.
 - 2) Include a list of acceptable and unacceptable materials at each container or bin.
 - 3) Inspect containers and bins for contamination and remove contaminated materials if found.
 - 4) Processed materials stockpiled on site shall not be mixed with other materials. Shape stockpiles to drain surface water. Cover stockpiles to prevent windblown dust.
 - 5) Processed material shall be stockpiled away from construction. Do not stockpile within drip line of remaining trees.
 - e. Remove recyclable demolition waste off project property and transport to recycling receiver or processor.
 - f. The following list is of common material types which can be recycled. The list of material types is in no way complete but is representative of materials that can be sorted and recycled as per the intent of this specification section.
 - 1) Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 2) Wood: Sort and stack members according to size, type, and length of member.
 - 3) Metals: Separate metal by type. Stack structural steel members according to size and length. Remove bolts, nuts, washers, and other hardware from members.
 - 4) Gypsum Board: Stack large clean pieces on wood pallets in a dry location. Remove edge trim and sort with other metals.
 - 5) Acoustical Ceiling Tile: Stack large clean pieces on wood pallets in a dry location.
 - 6) Metal Suspension System: Separate metal members including trim and other metals from acoustical ceiling tile and sort with other metals.
 - 7) Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and any tack strips. Store carpet in a dry location.
 - 8) Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
 - 9) Conduit: Reduce conduit to straight lengths and store by type and size.
4. Site clearing waste:
 - a. Excavated top soil and land clearing debris not recycled and reused on-site shall be removed to an off-site recycling location or disposed of at a landfill that accepts inert material.

C. Construction Waste:

1. Recyclable materials:
 - a. Prepare and maintain recyclable waste materials according to recycling facility requirements.
 - b. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
 - c. Recycle paper and beverage containers used by on-site workers.
 - d. Separate recyclable construction waste from other waste materials. Separate recyclable waste by material type at project site to the maximum extent practical according to approved waste management plan.
 - e. Separate recyclable construction waste from other waste materials. All recyclables may be co-mingled into one bin and separated off-site at the appropriate recycling facility.
 - 1) Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from the project site.
 - 2) Include a list of acceptable and unacceptable materials at each container or bin.
 - 3) Inspect containers and bins for contamination and remove contaminated materials if found.
 - f. Remove recyclable construction waste off project property and transport to recycling receiver or processor.
 - g. The following list is of common material types which can be recycled. The list of material types is in no way complete but is representative of materials that can be sorted and recycled as per the intent of this specification section.
 - 1) Cardboard Packaging: Breakdown into flat sheets. Bundle and store in a dry place.
 - 2) Polystyrene Packaging: Separate and bag materials.
 - 3) Pallets: As much as possible, require deliveries using pallets to remove pallets from the project site. For pallets that remain on-site, breakdown pallets into component wood pieces and comply with requirements for recycling wood.
 - 4) Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
 - 5) Wood: Clean Cut-Offs of lumber and grind or chip into small pieces.
 - 6) Gypsum Board: Stack large clean pieces on wood pallets in a dry location.

D. Disposal of Waste:

1. Except for items or materials to be salvaged, recycled, or otherwise reused remove and transport waste materials from project site and legally dispose of them in a manner acceptable to authorities having jurisdiction.
2. Do not allow waste material to accumulate on site.
3. Transport waste in a manner that will prevent spillage on adjacent surfaces and areas.

3.4 CLEANING

1. Clean in accordance with Specification Section – PROJECT CLOSEOUT:
 - a. Immediately clean any soiled surfaces to remain.

END OF SECTION

SECTION 01 77 20 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.
- C. Work Included:
 - 1. Project cleanup and coordination of all cleaning work required under all sections of this specification.
 - 2. Collection of and processing for delivery to the Architect of all Project Record Drawings required under this and other various Sections of the Specifications.
 - 3. Compile and assemble all required documents, operation data, maintenance manuals, and parts lists for all equipment items provided for this project.
 - 4. Start-up of all mechanical, electrical, and miscellaneous equipment items; and adjustment required for the performance specified.
 - 5. Compile and assemble all guarantees, warranties, or other written documentation to establish the requirements outlined under all sections of this specification.
 - 6. Repair and touch-up on all items damaged during the construction and handling processes.
 - 7. Furnish maintenance material and spare parts as specified within DIVISIONS 02 through 49 of these specifications.
 - 8. Deliver to the Architect all assembled copies of those items required in Articles 1 through 6 above for presentation to the Owner.
- D. It shall be the responsibility of the Contractor to provide all labor and materials necessary to achieve completion of the items listed under Paragraph A, B and C above, although certain items may be specified under the work of other trades. Periodic removal of debris, cleaning, repair, and testing of times in various areas of the construction site shall be carried out under the direction of the Contractor.

1.2 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Quality Assurance/Control Submittals:
 - a. Design Data.
 - 1) All design data as required by the Contract Documents.
 - b. Test Reports:
 - 1) Submit four (4) copies of reports.

- 2) Submit four (4) copies of reports required by regulatory requirements.
 - 3) Submit four (4) copies of ICC Evaluation Service Report.
 - 4) Submit four (4) copies of Testing Laboratory's report.
 - 5) All other Test Reports as required by the Contract Documents.
- c. Certificates:
 - 1) Submit three (3) copies of certificates.
- d. Manufacturer's Instructions:
 - 1) Submit three (3) copies of manufacturer's instructions.
- e. Manufacturer's Field Reports:
 - 1) Submit three (3) copies of manufacturer's field reports.
- f. Engineering Calculations:
 - 1) Submit four (4) copies of engineering calculations computed and signed by a registered Civil or Structural Engineer in the State of California.
2. Closeout Submittals in accordance with Specification Sections in Division One:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Operation Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - c. Warranty in accordance with Specification Section - WARRANTIES.
3. Project Record Documents:
 - a. Various Sections of the detailed specifications require Project Record Drawings to be prepared by the Contractor(s). These drawings shall be collected by the Contractor, checked for conformance to the specific requirements, and when completed, delivered to the Architect. The Contractor shall also be responsible for collecting bound operating and maintenance manuals required of all trades supplying equipment, and for delivering them to the Architect.
4. Documents Required for Project Certification
 - a. Compile and neatly assemble with indexed and labeled tabs, three (3) sets of the required documents for project certification by the State Agencies. The required documents include, but are not limited to, the following:
 - 1) Document Required List "Form" for Project Certification ORS-6.
 - a) This document shall be used to organize and index the required documents.
 - 2) Project Information "Forms":
 - a) Project Site Inspector(s) SSS-5.
 - b) In-Plant Inspector(s), required for re-locatable buildings only SSS-5.
 - c) Contract Information DSA-102.
 - 3) Final Verified Report "Forms" from the Architect and Engineers:
 - a) Architect's Final Verified Report DSA-6A/E.
 - b) Structural Engineer's Final Verified Report DSA-6A/E.
 - c) Mechanical Engineer's Final Verified Report DSA-6A/E.
 - d) Electrical Engineer's Final Verified Report DSA-6A/E.
 - 4) Final Verified Report "Forms" from the Contractor(s) and Inspector(s):
 - a) Project Site Inspector(s) Final Verified Report DSA-6.
 - b) Contractor(s) Final Verified Report DSA-6.
 - c) In-Plant Inspector(s) Final Verified Report DSA-6.
 - d) Special Inspector(s) Final Verified Report DSA-6.
 - 5) Other Final Verified Reports and Affidavits for:
 - a) Laboratory - To be signed by Licensed Professional Engineer.
 - b) Shop Welding and Fabrication - To be signed by AWS/CWI Welding Inspector
 - c) Field Welding - To be signed by AWS/CWI Welding Inspector
 - d) High Strength Bolt Installation
 - e) Glu-Laminated Fabrication

- f) Manufactured Trusses
- g) Masonry Inspection
- h) Engineered Fill - To be signed by the Geotechnical Engineer
- i) Bleacher Fabrication
- j) Other items required by the State Agencies
- 6) Notices, Certificates, and Change Orders
 - a) Notice of Completion - Signed by the Owner, Notarized and recorded with the County Records Office.
 - b) Weighmaster Certificate(s)
 - c) Automatic Fire Sprinkler System
 - d) Fire Alarm System Components
 - e) Fire Standpipe System
 - f) Fire Suppression System
 - g) Smoke Ventilation System
 - h) Skylight System
 - i) Bleacher System
 - j) Change Orders - Signed and fully executed.
 - k) Other documents and/or requirements required by the State Agencies
- 7) Field Visit Reports, Correction Reports, Punch Lists & Final Review Reports
 - a) Field Visit Reports from State Agencies
 - b) Field Visit Reports from Architect and Engineers
 - c) Inspector's Correction Reports
 - d) Contractor Punch Lists
 - e) Architect, Engineers and Owner Final Review Reports
 - f) A jointly signed and notarized Affidavit from the Contractor and Project Inspector (formerly the Inspector of Record), indicating that any and all items of correction noted in the above documents have been corrected (including Testing Laboratory Reports).

1.3 QUALITY ASSURANCE:

- A. Safety, Fire and Environmental Protection, and Insurance standards shall be strictly adhered to in all phases of the construction work. It shall be the responsibility of the Contractor to determine the standards applicable to this project as set forth in all codes, regulations, and ordinances having jurisdiction, and as set forth elsewhere in the Specifications.
- B. All specific requirements stipulated in, or required by code references included under all sections of DIVISIONS 02 through 49 inclusive of this specification, and as detailed under Article 3.4 of this Section, shall be required under this Contract.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Materials:
 - 1. Use only those specified materials or types of materials recommended and approved by the manufacturer of the item to be cleaned.
- B. Touch-Up Materials:

1. Use only those materials furnished by or as recommended and approved by the manufacturer of the item to be touched up. Colors and finish characteristics shall exactly match the base material and extra materials, labor, and services required to achieve this result shall be provided by the Contractor(s).
- C. Replacement Materials:
1. Materials that are damaged and not repairable, or materials that are destroyed shall be replaced with equal and identical materials of the same manufacture and shall function in conjunction with the remaining portions of that material. Items no longer manufactured or available shall be replaced with comparable materials as approved by the Architect and at no additional cost to the Owner.
 2. Materials that are required for maintenance replacement by the owner after the guarantee period has expired, or by the contractor during the guarantee period shall exactly match those materials installed as to make, style, color lot, etc., under this contract, and shall be delivered to the owner in marked, identified containers.
- D. Extra Materials:
1. Carefully examine the requirements of the applicable Sections of all DIVISIONS and specifically of DIVISION 09 and deliver the materials required to the Owner.

PART 3 - EXECUTION

3.1 REPAIR AND RESTORATION

- A. All damaged items shall be repaired and replaced as directed using proper materials and craftsmen skilled in that particular trade. Materials shall be as follows:
1. All repair or replacement parts shall be of the same equality and manufacturer as the item being repaired.
 2. All touch-up paint shall be as provided by the item manufacturer for that purpose and shall exactly match the original color and finish.

3.2 FIELD QUALITY CONTROL

- A. Final Reviews:
1. In addition to all items covered under those Sections of Divisions 02 through 49 inclusive, the Contractor shall comply with the requirements stated herein.
 - a. The Contractor shall request in writing a final review (see Contractor's Request for Final Review form at the end of this Specification Section).
 - 1) The Contractor shall allow a forty-eight (48) hour time period of advance notification prior to the requested date and time indicated on the Review Request form.
 - 2) The Contractor represents that the work has been carefully inspected by the Contractor to determine that the work is complete and in compliance with all requirements set forth.
 - b. The Contractor shall prepare and shall submit the initial Contractor's Punch List identifying the items that remain uncompleted forty-eight (48) hours prior to the scheduled final review by the Architect.
 - c. Under no circumstances shall the Contractor ask the Architect or his representative to make these determinations for him.

2. The Architect shall review the initial Contractor's Punch List along with the Owner's Project Inspector, and determine together whether or not the Project is ready for final review. If approved, the Architect or its representative will make the final review on the date and time requested in the Contractor's Request for Final Review form, except under the following conditions:
 - a. Upon reviewing a portion of the Project and finding quantities of work incomplete or not in compliance, the review shall cease, and the Architect will notify the Contractor.
 - b. If the Contractor has assured the Architect of the completeness and/or accuracy of the work, and the review does not bear this contention out.
3. The above conditions will be adhered to rigidly to prevent the Architect from being required to act as a supervisory agent of the Contractor by being asked to determine the degree of completion,.
 - a. When the Contractor requests additional reviews, he shall reimburse the Architect for all time and expense incurred as indicated on the Contractor's Request for Final Review form at the end of this Specification Section.
 - b. The Architect is herein defined as any of those firms or individuals listed by references on the drawings, including all consultants identified herein.
 - c. All requests for Project Final Review (and re-review) shall be made in writing on the form provided at the end of this Specification Section.
4. When the Architect does approve of the degree of readiness for the Project based on the initial Contractor's Punch List and the readiness of the Project, the Architect will make his final review, adding to the Contractor's Punch List any other items that require further completion.
5. The Contractor shall take the initial Contractor's Punch List, together with the Architect's Punch List, and initial and date each item on each list as to when it was completed.
6. Once both lists are completed and signed by the Project Inspector, the Contractor shall submit to the Architect the completed lists for final review and approval prior to filing for Substantial Completion.

3.3 CLEANING

A. During Construction:

1. Oversee cleaning and ensure that building and grounds are maintained free from accumulations of waste materials and rubbish.
2. Sprinkle dusty debris with water.
3. At reasonable intervals during progress of work, clean up site and access and dispose of waste materials, rubbish, and debris.
4. Provide suitable containers and locate on site for collection of waste materials, rubbish, and debris.
5. Do not allow waste materials, rubbish and debris to accumulate and become an unsightly or hazardous condition.
6. Remove waste materials, rubbish and debris from the site and legally dispose of at public or private dumping areas off the Owner's property.
7. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for acceptance or occupancy.
8. Lower waste materials in a controlled manner with as few handling as possible; do not drop or throw materials from heights.
9. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

B. Final Cleaning:

1. Use experienced professional cleaners for final cleaning.

2. At completion of construction and just prior to acceptance or occupancy, conduct a final review of exposed interior and exterior surfaces.
3. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces.
4. Repair, patch, and touch-up marred surfaces to match adjacent finishes.
5. Broom clean paved surfaces; rake clean other surfaces of grounds.
6. Replace air conditioning filters if units were operated during construction.
7. Clean ducts, blowers, and coils if air conditioning units were operated during construction.
8. Maintain cleaning until the building, or portion thereof, is accepted by the Owner.

3.4 DEMONSTRATION

- A. During Construction and as each piece of equipment is installed, provide the following tests:
 1. Verify that all external service connections have been properly completed, and that piping and/or wiring is properly sized, and contain all necessary safety devices.
 2. Verify that the equipment is free of shipping materials, tie downs, or other internal obstructions.
 3. Conduct tests employing the manufacturer's operating instructions as a sequential guide.
 4. Verify that all portions of the equipment function properly and that the total performance criteria is satisfied.
 5. Make adjustments, replacements, or repairs necessary to achieve full operational capability and repeat tests until performance is achieved and approval obtained.
- B. Prior to acceptance, verify that all conditions specified in the Article titled FIELD QUALITY CONTROL, Final Review, have been satisfied and that equipment is ready for continuous use. Provide the following services preparatory to acceptance:
 1. Clean or replace all filters and/or strainers.
 2. Adjust all belts and drive mechanisms.
 3. Lubricate all moving parts as required by manufacturer's operating instructions.
 4. Demonstrate to the Owner's representative and the Architect or Engineer the method and sequence of operation, and provide testing devices and/or data to verify that performance equals that specified.
 5. Provide operating instructions in bound form along with manufacturer's parts list and written warranties.

3.5 SCHEDULES

- A. See next page for Request for Final Review from the Contractor(s):

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07/31/2024

SECTION 01 78 36 – WARRANTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. In addition to providing all other warranties specified in the Project Manual and without affecting any rights of Owner under State or Federal law, Contractor shall warrant that the Work done under this Project Manual will be free from faulty materials or workmanship and hereby agrees, upon receiving notification from the Owner or his Agent, to immediately remedy, repair or replace, without cost to the Owners and to his entire satisfaction, all defects, damages or imperfections appearing in said work within a period of one (1) year unless specified otherwise, after date of final acceptance by the Owner of all work done under this Project Manual, regardless of whether or not the Owner or persons operating under contract with the Owner partially or wholly occupies any portion of the work prior to acceptance. For work performed after completion, the one (1) year period shall be extended by the period of time between the date of final acceptance by Owner and actual performance of the work. This obligation shall survive acceptance of the work and termination of the Contract.
 - 1. Warranties shall be in the form outlined below and shall be submitted in duplicate to the Contractor and submitted on his own letterhead.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 SUBMITTALS

Warranty Form: (following page.)

(Contractor's Letterhead)

Project Number: _____

Project Name: _____

WARRANTY FOR

We hereby warrant and the General Contractor warranties that

has been done in accordance with the Drawings and the Specifications and that the Work as installed will fulfill the requirements of the warranty included in the Project Manual. We agree to repair, replace any or all of our work together with any other adjacent work which may be displaced or damaged by so doing that may prove to be defective in its workmanship or materials within a period of _____ years from date of acceptance of the above-named without any expense to the Owner, ordinary wear and tear and unusual abuse or neglect excepted. In the event of our failure to comply with above-mentioned conditions within ten (10) days after being notified in writing by the Owner or his agent, we collectively or separately, do hereby authorize the Owner to proceed to have said defects repaired and made good at our expense and we will honor and pay the costs and charges therefor upon demand.

(Signature of Subcontractor)

(Signature of Contractor)

Date: _____

- A. Submit 2 copies of all manufacturer's or installer/applicator's warranties and bonds as specified within Division 02 –49.
- B. Submit to Architect together with Project Record Documents.
- C. Accompany submittals with transmittal letter in duplicate.
- D. When Product Submittals are required, submit copy of warranty with product submittal.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION - NOT APPLICABLE

END OF SECTION

SECTION 01 78 39 – PROJECT DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Project As-Built Drawings.
 - 2. Project Record Drawings.
 - 3. Record Specifications.
 - 4. Record Product Data.
- B. Related Requirements: The following Project Manual Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.3 DEFINITIONS

- A. CONTRACT DOCUMENTS: Contract Documents include Contract Forms, Project Manual (Contract Requirements and Specifications), Drawings, Addenda, Change Orders and Modification Documents (Supplemental Instructions, Request for Information, Construction Change Directives).
- B. PROJECT "AS-BUILT" DOCUMENTS: A set of Contract Documents used during construction for recording of actual construction information during construction. The recording of construction information shall be maintained on the Contract Drawings and in the Project Manual.
- C. PROJECT "RECORD" DOCUMENTS: A set of Contract Documents used at the completion of construction for transferring and documenting the actual construction information recorded on the PROJECT "AS-BUILT" DOCUMENTS.
- D. RECORD PRODUCT DATA: A set of Submittals and Shop Drawings that have documentation of field changes made after review.
- E. AGENCY DOCUMENTATION: Documents required by the Agency Having Jurisdiction to be prepared and submitted by the contractor.

1.4 SUBMITTALS:

- A. Submit the following in accordance with specification Section SUBMITTAL PROCEDURES.
- B. Format for Submittals:
 - 1. Accompany each submittal with a SHOP DRAWING AND SUBMITTAL TRANSMITTAL:
 - 2. PDF electronic file names shall match the Sheet Numbers of the Contract Documents.
 - 3. Provide labels on DVD's and DVD Cases and include the following:
 - 4. First Line: CLOSE-OUT DOCUMENTS
 - 5. If submittal contains multiple disks append to first line Disk, i.e. (1 of 2)
 - 6. Second Line: Project Name and Year
 - 7. Third Line: Architect Firm Name and Architect's Project Number
 - 8. Fourth Line: DSA or HCAI Number (if applicable)
 - 9. Fifth Line: Contractor Company Name

10. PDF files for Project "Record" Documents and Record Product Data shall be combined with PROJECT CLOSEOUT, Maintenance Data and Operations Data, and WARRANTIES on a single set of DVD's.
 - C. PROJECT "AS-BUILT" DOCUMENTS: Comply with the following:
 1. Number of Copies: Submit one paper-copy set of marked-up as-built drawings and one paper-copy of marked-up as-built specifications.
 2. Clearly Label each copy "PROJECT 'AS BUILT' DOCUMENTS" in two-inch-high printed letters.
 - D. PROJECT "RECORD" DOCUMENTS: Comply with the following:
 1. Number of copies: Submit copies of the Record Documents as follows:
 - a. Initial Submittal:
 - 1) Submit one paper-copy of marked-up record drawings and one paper copy of marked-up record specifications,
 - 2) Alternatively, submit PDF electronic files of scanned marked-up record drawings and marked-up record specifications on one set of DVD's
 - 3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 2. Final Submittal:
 3. Submit one paper-copy of marked-up record drawings, one paper copy of marked-up record specifications, and PDF electronic files of scanned marked-up record drawings and marked-up record specifications on three sets of DVD's.
 4. Each record drawing sheet shall be labeled, "PROJECT "RECORD" DOCUMENT.
 5. Print each drawing, whether or not changes and additional information were recorded.
 6. Clearly Label each copy "PROJECT "RECORD" DOCUMENTS in two-inch-high printed letters in a prominent location.
 - E. RECORD PRODUCT DATA: Comply with the following:
 1. Number of Copies:
 - a. Submit one paper-copy set of marked-up shop drawings.
 - b. Submit three DVD's of PDF electronic files of scanned marked-up shop drawings.
 - F. AGENCY DOCUMENTATION: Comply with the following:
 1. Submit Documentation Required by the Agency Having Jurisdiction utilizing the format and system established by the Agency.
- 1.5 SYSTEM DESCRIPTION
- A. The Architect considers the Project Record Documents to be of significant importance to the Owner.
 - B. Project Record Documents provide important information for the Owner's records, they form an invaluable record for future reference for concealed conditions, facilities management processes, and future additions and renovations.

PART 2 - PRODUCTS

- 2.1 General:
- A. All costs (including the time) required for recording, transferring, and copying all documentation shall be part of the Contractor's Overhead Expense.
 - B. Provide red pencil or ink (contrasting color) for all marking of the PROJECT "AS-BUILT DOCUMENTS, PROJECT "RECORD" DOCUMENTS, and RECORD PROJECT DATA.
 - C. Do not permanently conceal any work until required information has been recorded.
- 2.2 RECORD DRAWINGS
- A. PROJECT "AS-BUILT" DOCUMENTS: Maintain one set of marked-up paper copies of the Contract Drawings: and Specifications, incorporating new and revised drawings as modifications are issued.
 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data,

whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
- b. Accurately record information in an acceptable drawing technique.
- c. Record data as soon as possible after obtaining it.
- d. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Elevation for finish grade for all points indicated on Site Grading Plan.
 - b. Depths of various elements of foundation in relation to first floor finish elevation.
 - c. Horizontal and vertical location of underground utilities and appurtenances referenced to visible and accessible features of structure.
 - d. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities Field changes of dimensions and details.
 - j. Changes made by Addenda, Change Orders and other Modification Documents.
 - k. Details not on original Contract Documents.
 - l. Changes made on Shop Drawings.
3. Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - b. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - c. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - d. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 - e. Note related Changes Orders, record Product Data, and record Drawings where applicable.
4. Mark the Contract Drawings and Specifications completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
5. Note Request for Information numbers, Supplemental Instruction numbers, Construction Change Directive numbers, Change Order numbers, and similar identification, where applicable.

2.3 PROJECT "RECORD" DOCUMENTS:

- A. General: Transfer all changes, notations, etc. from the "AS-BUILT" PROJECT DOCUMENTS to the "PROJECT RECORD" DOCUMENTS in the same quality as the original Contract Documents.

2.4 RECORD PRODUCT DATA

- A. Maintain one set of marked-up paper copies of the Shop Drawings and Product Data, incorporating any modifications to the reviewed documents.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.
4. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.5 AGENCY DOCUMENTATION

- A. Contractor shall prepare and upload all applicable forms pertaining to the Contractor as required by the Division of State Architect DSA Procedure 13-02, including but not limited to:
 1. DSA 6-C - Contractor Verified Report.
 2. NFPA System Record of Completion.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE:

- A. Recording:
 1. Keep all documents current, PROJECT "AS-BUILT" DOCUMENTS shall be kept current at all times. Post changes and revisions to project as-built documents as they occur; do not wait until end of Project.
 2. The Project Inspector will review the PROJECT "AS-BUILT" DOCUMENTS periodically for the Architect at the time Payment Requests are processed. Should the PROJECT "AS-BUILT DOCUMENTS not be current and up to date, the Owner reserves the right to hold the Payment Request until compliance with the Contract Documents has occurred.
- B. Maintenance of Documents:
 1. Maintain at job site the following:
 - a. Contract Drawings.
 - b. Project Manual/Specifications.
 - c. Addenda.
 - d. Reviewed shop drawings.
 - e. Change Orders.
 - f. All Modification Documents.
 - g. Field test records.
 2. Store documents in field office apart from documents used for construction.
 3. Provide files and racks for storage of documents.
 4. File documents in accordance with Project Filing Format or Uniform Construction Index.
 5. Maintain documents in clean, dry, legible condition.
 6. Do not use record documents for construction purposes.
 7. Make documents available at all times for inspection by Architect, Owner and Owner's Inspector.

END OF SECTION

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. Section includes requirements governing execution of the work including, but not limited to, the following:
 - a. Demolition and removal of selected portions of building or structure.
 - b. Demolition and removal of selected site elements.
 - c. Salvage of existing items to be reused or recycled.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS
 - 2. DIVISION 01 SPECIFICATION SECTIONS
 - 3. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP
 - 4. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP

1.2 REFERENCES

- A. Standards:
- B. In accordance with the latest edition of the following standards:
 - 1. ANSI A10.6 American National Standards Institute

1.3 DEFINITIONS

- A. Remove: Detach items from existing site or building (s) and legally dispose or recycle off-site.
- B. Remove and Salvage to Owner: Carefully detach from existing site or building (s), in a manner to prevent damage, and deliver to Owner.
- C. Remove and Reinstall: Detach items from existing site or building (s), prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing item(s) within project site that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Shop Drawings:
 - a. Proposed Protection Measures - Submit report and drawings that indicates the measures proposed for protecting individuals and property for dust and noise control.
 - 1) Indicate proposed locations and construction of barriers.
 - 2) Indicate occupant paths of egress and travel.
 - 3) Indicate how long utility services will be interrupted.
 - b. Salvaged Item Inventory List
 - 1) Indicate items to be salvaged and delivered to Owner.
 - 2. Closeout Submittals:
 - a. Existing Warranties
 - b. Pre-demolition Photographs

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. In accordance with Specification Section - REGULATORY REQUIREMENTS and the following:
 - a. CAL/OSHA California Division of Occupational Safety and Health Administration.
 - b. CM County of Merced, codes and ordinances
 - c. EPA Environmental Protection Agency

B. Meetings:

1. Pre- Demolition: Schedule prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Review requirements of work performed by others that rely on substrates exposed by selective demolition work.
 - c. Identify any potential problems that may impede planned progress and proper demolition of work.
 - d. Review structural load limitations of existing structure.
 - e. Review areas where existing construction is to remain and requires protection.
 - f. Review demolition waste disposal and material recycling procedures.
2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper work progress.
 - b. Identify any problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems.
 - b. Establish method and procedures to maintain protections while progressing to project completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Cleaning, handling, and packing:

1. Salvaged Items and Reinstalled Items shall be handled in such a manner as to assure that they are free from damage.
2. Salvaged Items shall be cleaned and packed or cleaned and palletted.
3. Reinstalled Items shall be cleaned.

B. Storage and protection

1. Salvaged Items and Reinstalled Items shall be stored in a dry, protected area.
2. Salvaged Items and Reinstalled Items shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation underneath.
3. Cover with protective waterproof covering providing for adequate air circulation and ventilation.

C. Waste Management and Disposal:

1. Disposal of all selective demolition items shall be per Specification Section - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

1.7 PROJECT CONDITIONS

A. Environmental requirements:

1. Dust control - perform site, exterior, and interior work in a manner as to minimize the spread of dust and flying particles.
 - a. Thoroughly moisten appropriate surfaces as required to prevent dust from being a nuisance to the occupants, public, and neighbors.
2. Noise control - perform work in a manner as to minimize construction noise.
 - a. When a certain level of noise is unavoidable and is objectionable to the occupants of the adjacent spaces, buildings, or premises, coordinate with Owner and make arrangements to perform such work at the most appropriate time periods of the day.

B. Existing conditions:

1. Examine project site and building(s) and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
2. Conduct work so as not to interfere unnecessarily with adjacent buildings, roads, streets, drives, and walks.
 - a. Do not close or obstruct streets, alleys, walks, or passageways without permission from authorities having jurisdiction and coordinating same with immediate neighbors whose business operation may be affected.
 - b. Safety measures shall be taken to insure an uninterrupted flow of traffic around the site as required by local Police and Fire Departments
3. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
4. Maintain existing utilities indicated to remain in service and protect against damage during selective demolition work.
 - a. Maintain fire-protection facilities in service during the work.
5. Demolition waste becomes the property of the Contractor.
6. Storage or sale of removed items on-site is not permitted.
7. It is not expected that hazardous materials will be encountered in the Work.
 - a. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish all materials, tools, equipment, facilities, and services as required for performing the selective demolition and removal work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions:

1. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
2. Execution of work under this specification section shall constitute acceptance of existing conditions.
3. Obtain all necessary permits and authorizations by regulatory agencies required to perform the Work under this Section.
4. Verify that utilities have been disconnected and capped before starting selective demolition operations.
5. Verify that rooftop utilities and service piping have been shut-off prior to roof selective demolition.
6. Record existing conditions by use of Pre-demolition Photographs.
 - a. Inventory and record the condition of items to be salvaged and/or re-installed.

3.2 PREPARATION

A. Coordination:

1. Before proceeding, verify plans match existing conditions.

2. Review documents of existing construction provided by Owner against existing conditions.
3. If conflicts are encountered, report it to the Architect. Then prepare recommendation(s) for correction and submit to Architect for review.
4. Coordinate work under this specification section with work specified under other sections.
5. Coordinate any utility and HVAC unit shut-down with owner 48 hours in advance of the anticipated shut-down.
 - a. Do not interrupt utilities and HVAC units serving occupied or used facilities, except when authorized in writing by the Owner.
 - b. Provide temporary service during interruptions to existing facilities, as may be required by the Owner to maintain essential services.
6. Prior to site selective demolition, review status of trees and shrubs with Architect and Owner. The Owner may wish to relocate trees or shrubs outside the limits of construction.
7. Prior to roofing selective demolition, coordinate with Owner to shut down air intake equipment and service piping in the vicinity of work.

B. Protection:

1. Structure and Property:
 - a. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings, landscape, and facilities to remain.
 - b. All damage inflicted on public and private property and the property of the Owner shall be repaired or restored to the original condition prior to the start of this Work. All repair or replacement work shall be done at no additional cost to the owner.
 - c. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building and site.
 - d. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and other weather damage to building envelope, structure, and interior areas.
 - e. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - f. Protect and maintain utility services and mechanical/electrical systems to remain.
 - g. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - h. Cover all air supply and return ducts to remain before proceeding with demolition work.
 - i. Cover air intake louvers before proceeding with work that will affect indoor air quality.
 - j. During roof selective demolition have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
2. Temporary Shoring:
 - a. Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1) Strengthen or add new supports when required during progress of selective demolition.

3.3 APPLICATION

A. General:

1. Selective demolition shall include the removal of all components of the existing building and/or site described in the documents to be removed. Unless otherwise specified, the component identified for removal shall include all materials, accessories and fabrications associated with that component.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
 - a. Temporarily cover opening to remain.
 - b. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. When removing structural framing members, lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 5. Locate selective demolition equipment and demolished debris so as not to impose excessive loads on supporting walls, floors, or framing.
 6. Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems.
 7. Demolished items and materials that are recyclable or slated for disposal shall be promptly dealt with per Specification Section - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
 8. Removed and Salvaged items:
 - a. Clean salvaged items.
 - b. Pack or crate items after cleaning. Identify contents of containers.
 - c. Store items in a secure area until delivery to Owner.
 - d. Transport item to area as designated by Owner.
 - e. Protect items from damage during transport and storage.
 - f. In addition to items indicated elsewhere, salvaged items that the Owner wants to retain in usable condition are as follows:
 - 1) All door hardware
 - 2) All unit heater and controls
 - 3) All energy management controls
 - 4) All security system devices
 9. Removed and Reinstalled items:
 - a. Clean and repair items to functional condition adequate for intended reuse.
 - b. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - c. Protect items from damage during transport and storage.
 - d. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
 10. Existing Items to Remain:
 - a. Protect construction indicated to remain against damage and soiling during selective demolition.
- B. Site Selective Demolition:
1. Utility lines to be abandoned within the construction area shall be removed and stubbed off outside the limits of construction.
 2. Maintain existing storm drainage system to remain in functioning condition. Prevent debris from entering or blocking drains and piping. Use drain plugs specifically for this purpose. Remove drain plugs at the end of each work day.
 3. Refer to drawings for trees and shrubs to be removed. Protect certain trees as indicated.
 - a. Remove tops, trunks, and roots of trees and shrubs to a minimum depth of 3 feet or to a depth required to remove all roots 1/4 inch diameter and larger.
 - b. Chip removed trees, shrubs, and roots.
 - 1) Removed chipped material to recycling station.
 - 2) Recycle chipped material into mulch for this project. Refer to Specification Section - LANDSCAPE PLANTING for treatment.

4. Remove debris, concrete, asphalt, and any other obstruction to the extent indicated.
 5. Remove all:
 - a. Buried objects which will interfere with the Work.
 - b. Irrigation lines, irrigation risers, and irrigation valves.
 - c. Stand pipes.
 - d. Water wells and pumps.
 - e. Electrical service and power poles.
 6. At building pads, site improvements, or trenching, strip topsoil which contains:
 - a. Grass, weeds, and natural vegetation to a minimum depth of **12** inches.
 - b. Stumps and roots 1/4 inch and larger.
 7. Remove non-soil materials from topsoil, including clay lumps, gravel, trash, debris, weeds, roots, other waste materials, and objects more than 1/2 inch in diameter.
 8. Stockpile reusable topsoil away from excavation and where work is to proceed.
 - a. Do not stockpile topsoil within drip line of remaining trees.
 9. Non-soil materials removed from topsoil shall be separated into like materials and recycled either within the project or removed from the project site to a recycling station.
 - a. Those waste materials that are non-recyclable shall be legally disposed off of the project site.
- C. Roofing Selective Demolition:
1. Maintain roof drains in functioning condition to ensure roof drainage at end of each work day. Prevent debris from entering or blocking roof drains and conductors. Use roof drain plugs specifically for this purpose. Remove roof drain plugs at end of each work day, when no work is taking place, or when rain is forecast.
 2. Remove existing roofing membrane and other roofing system membrane components down to the deck including flashings, copings, and roof accessories.
 - a. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry. Remove un-adhered bitumen and felts.
- 3.4 CLEANING
- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT:
1. Clean any soiled surfaces to remain immediately.
 2. Existing substrates shall be clean and ready for the installation of any additional materials.
 3. Leave site areas level and free of any ruts or debris. Appearance of earth surface shall be equal to or better than adjacent undisturbed surfaces.

END OF SECTION

SECTION 03 11 01 – CONCRETE FORMWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all Concrete Formwork materials, and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 15 14 DRILLED ANCHORS
 - 4. 03 20 00 REINFORCEMENT
 - 5. 03 30 00 CAST-IN-PLACE CONCRETE
 - 6. 05 12 00 STEEL AND FABRICATIONS
 - 7. 06 10 00 ROUGH CARPENTRY
 - 8. 07 92 00 SEALANTS
 - 9. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 10. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the latest edition of the following standards:
 - a. ACI American Concrete Institute
 - b. APA The Engineered Wood Association (formerly the American Plywood Association)
 - c. PS Product Standards of the U.S. Department of Commerce, latest edition
 - d. WCLIB West Coast Lumber Inspection Bureau

1.3 DEFINITIONS

- A. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.
- B. Unexposed: concealed surface.
- C. Exposed: exposed surface.

1.4 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data.
 - a. Forming materials.
 - b. Tie rods and spreaders.
 - c. Formwork for exposed concrete.
 - d. Form coatings and release agents.
 - 2. Shop Drawings:
 - a. The Contractor shall submit drawings showing the proposed form tie locations for exposed form indentations.
 - 3. Samples.
 - a. Form liners for specific finished concrete surfaces.
 - 4. Quality Assurance/Control Submittals:
 - a. Manufacturer's written Instructions:
 - 1) Instructions for specific form liner manufacturer indicated.

5. Closeout Submittals:
 - a. Record Documents in accordance with Specification Section – PROJECT DOCUMENTS.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 1. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 2. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the Work.
- B. Regulatory Requirements:
 1. In accordance with Specification Section - REGULATORY REQUIREMENTS.
- C. Mockups:
 1. Cast in accordance with Specification Section – CAST-IN-PLACE CONCRETE, Part 1 Article titled "SUBMITTALS," paragraph titled "Mockups" for requirements.
 - a. Provide with all applicable joints, grooves, textures, etc.

1.6 WARRANTY

- A. Contractor's General Warranty:
 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period: One (1) Year.
- C. Installer's Warranty:
 1. In accordance with the terms of the Specification Section - WARRANTIES.
 - a. Warranty Period: One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 UNEXPOSED FINISH FORMS

- A. Provide plywood, lumber, or another acceptable material.
 1. Lumber shall be dressed on at least two edges and one side for tight fit, complying with WCLIB Standard Grading and Dressing Rules #17, for Douglas Fir Form Lumber.
 2. When plywood is used, provide panels complying with PS1, B-B (Concrete Form) Plywood, Group 1, EXT-APA mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

2.3 EXPOSED FINISH FORMS

- A. Provide plywood panel type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practical sizes to minimize number of joints and to conform to joint system shown on the drawings.
1. Single Pour Forms: Provide liner panels that are complying with PS1, MDO Plywood, B-B, Group 1, EXT-APA, mill-oiled, edge-sealed, with each piece bearing legible inspection trademark, which are limited to "single-pour use" forms, that are manufactured by SIMPSON TIMBER PRODUCTS, or approved equivalent.
 2. Multiple Pour Forms: Provide HDO Plywood "Multipour" liner panels, which are limited to "double-pour use" forms, that are manufactured by SIMPSON TIMBER PRODUCTS, or approved equivalent.

2.4 CIRCULAR COLUMN FORMS

1. All circular concrete columns identified on the drawings shall be formed with "Spiral Seam" SONOTUBE Fiber Forms, as manufactured by SONOCO PRODUCTS COMPANY, or approved equivalent.

2.5 TEXTURED FORM LINERS

- A. Use units of face design, size, arrangement, and configuration to match texture detail shown on the drawings. Provide solid backing and form supports to ensure stability of textured form liners.
1. CENTRIA C15-40 x 9/16" deep flutes, galvanized metal panels, or approved equivalent, to match corrugated roofing found in Specification Section - METAL PANELS.
 - a. Should a substitution be allowed in Specification Section - METAL PANELS for the CENTRIA panels, then coordinate with the new product so as to match the corrugations.
 2. GREENSTREAK PLASTIC PRODUCTS COMPANY Model #347, Trapezoid with Aggregate Face, or approved equivalent.
 - a. Requires manufacturer's backup strips to keep deep reveals from deflecting when concrete is poured.

2.6 PERMANENT FORMS

- A. Abandoned in place:
1. Provide forms for concrete pan-type construction with covers and closures.
 2. Forms designed to be left in place, shall be metal or fiberglass pan forms that will not be subject to moisture damage or decay.
 3. Provide standard or tapered end forms if required to create shapes indicated.
 - a. Manufacturer: MOLDED FIBERGLASS FORM COMPANY.

2.7 NON-COMPRESSIVE HIGH DENSITY FOAM FILL

- A. Foam-Control Geofoam, EPS19, complying with ASTM D 6817 "Standard Specification for Rigid Cellular Polystyrene Geofoam", with the following physical characteristics:
1. Density, min., kg/m³: 18.4.
 2. Compressive Resistance, @ 1 percent deformation, min., psi: 40.0.
 3. Flexural Strength min., psi: 207.0.
 4. Oxygen index, min., volume percent: 24.0.
- B. Accessories: Provide all adhesives, "geogripper" plates, etc. to comply with manufacturer's written installation instructions for a complete and functional installation.

2.8 ACCESSORIES

- A. Cement Compound Plugs:
1. Provide gray colored cement compound plugs ("SnaPlug" by MEADOW / BURKE, or approved equivalent) in highly visible concrete surface areas.
 - a. Provide "flush type" in cone holes of size appropriate to the hole size created by tie-holes.

2. Provide a waterproof neoprene adhesive ("SnaPlug Bonder" by MEADOW / BURKE, or approved equivalent), resistant to weather aging and bacterial growth, for adhering cement compound plugs into cone holes.
- B. Chamfer Strips:
 1. Provide wood chamfer strips free of knots, for forming edges of cast-in-place concrete.
- C. Double Sided Foam Tape: Provide "Scotch" double sided, high density, pressure sensitive adhesive, foam tape as manufactured by The Tape Division of 3M PRODUCTS, INC., or approved equivalent.
- D. Form release agent:
 1. Provide commercial formulation form release agent with a maximum volatile organic compounds (VOC's) in compliance with the CARB in the area where the project is located, that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 2. Provide form liner manufacturer's form release agent when a particular form liner is used to maintain compatibility with form release agent and the form liners used for this project.
- E. Rustication Strips:
 1. Provide wood rustication strips free of knots, for forming straight continuous reveals (either vertically or horizontally) and PVC rustication strips as manufactured by MEADOW / BURKE, for forming curved continuous reveals (either vertically or horizontally).
- F. Spreaders and ties for loose plywood forming:
 1. Spreader Ties: Use metal spreaders and ties for surfaces to be sacked. Use type that will give positive tying and accurate spreading for accurate sizing of cast walls or forms. Snap type shall leave no metal closer than 1-1/2 inches from exposed surface of concrete and have spreader cones no larger than 1 inch diameter. MEADOW / BURKE COMPANY.
- G. Nailer Strip:
 1. Provide decay resistant pressure treated wood nailer strips of sizes and locations indicated on the drawings.
 - a. For roof systems, provide compatible materials with the roof system manufacturer's applications.
 - b. Provide fire retardant pressure treated wood nailer strips when the roof assembly requires a Class A rating.
 2. All pressure treated wood (decay or fire-retardant) shall be in accordance with the applicable standards of the AWPAs as referenced in the Specification Section - ROUGH CARPENTRY.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface preparation:
 1. Consult with other Trades relative to required openings, and items to be embedded in concrete (i.e., piping, conduit, hangers, reglets, anchors, inserts, sleeves, etc.). Coordinate work specified under other sections to ensure proper, adequate interfacing between trades, for openings, chases, blockouts, and other required interfacing items.

3.2 ERECTION

- A. All formwork shall be:
 1. Designed and constructed in accordance with ACI Standard 347 "Recommended Practice for Concrete Formwork."
 - a. Follow ACI 303R "Guide to Cast-In-Place Architectural Concrete" for further recommendations in design and use of Patterned Form Liners.
 2. Construct to size, shape, alignment, elevation and position of all concrete elements.

- a. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required in the work. Use selected materials to obtain required finishes.
- b. Orient circular fiberglass forms so that the seam is always facing the nearest adjacent wall, or an obscure side not highly visible. Contact the Architect for conditions not easily determined.
3. Properly separate and securely tie with Spreaders and Ties to maintain proper shape. Wood spreaders shall not be allowed to remain in concrete work.
 - a. Use "Penta-Ties" where indicated on the drawings. Glue in cement compound plugs.
4. Brace, support and center sufficiently to carry without excessive deflection all live and dead loads imposed during construction and placement of concrete, and to insure safety to workers and passersby.
 - a. Block adjoining permanent pan units left in place to prevent lateral deflection of forms while placing concrete.
5. Properly construct to eliminate all open joints or discontinuous surfaces.
 - a. Solidly butt joints with double sided foam tape, apply silicone sealant at concrete face, and provide backup at joints to prevent cement paste or mortar from leaking.
- B. All joints shall be:
 1. Uniform and backed by 2 inch material.
 2. Continuous and level or plumb.
 3. Sufficiently tight (with double sided foam tape and silicone sealant) to prevent leakage of cement paste.
 - a. Locate joints of formwork whenever possible at rustication joints.
 4. Subject to Architect's approval.

3.3 INSTALLATION

- A. General: Design, engineer, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.
 1. Access Openings: Shall be provided in forms for cleaning and inspection of forms and reinforcement.
 - a. In Wall Forms: Provide openings for each pour, composed of a form section held out until inside of each formed cavity has been cleaned, so that no "access hole" is visible in the finished concrete surface.
 - b. In Column Forms: Provide openings for each pour, composed of a form section held out until inside of each formed cavity has been cleaned, so that no "access hole" is visible in the finished concrete surface.
 - 1) Clean out forms prior to placement.
 - 2) Protect positioned forms prior to pouring from being damaged by rain or snow.
 - 3) Place a block under the form so that it does not stand in water or snow. Remove block and reposition form prior to pouring.
 - 4) Clean out forms prior to pumping concrete.
 - 5) Forms (according to manufacturer's written recommendations) shall not be left on the columns for longer than five days.
 - 6) Remove the form in accordance with manufacturer's written recommendations without damaging the poured column finish.
 - 7) If columns are stripped prior to the completion of the project, take steps to protect from damage. Replace the form halves on the stripped column and secure with wire.

2. Architectural Concrete elements shall be formed with MDO (or HDO) form plywood where face uniformity is required such as on signs, plaques, kiosks, and landscape elements.
3. Side forms at unexposed footings may be omitted if excavation stands without caving.
 - a. Make footing trench two (2) inches wider than width of concrete footing indicated on the drawings, when earth is used as a form.
 - b. Cut trenches true and straight.
 - c. Make side cuts neat and plumb.
 - d. Bottom of trenches shall be level with reasonably sharp corners.
4. Formwork above grade (stairs, curbs, exposed faces of concrete foundations, etc.) shall be:
 - a. Plywood type as specified treated with Sealer.
 - b. Constructed with plumb and level joints.
 - c. Separated with removable or snap type Spreaders and Ties. Do not use wire ties.
5. Unintentional indentations in the surface of the concrete left after removal of spreaders and ties shall be filled and sacked unless the architect's approval is given to do otherwise.
 - a. Install Cement Compound Plugs where exposed form tie indentations occur.
6. Sleeves, anchors and bolts, angles, supports, ties and other materials in connection with concrete construction shall be secured in position before the concrete is placed.

3.4 CONSTRUCTION

A. Special Techniques – Form Removal and Reuse of Forms:

1. All forms shall be completely removed.
2. Time of Removal shall be in accordance with ACI 301 "Specifications for Structural Concrete," which requires concrete to reach its specified compressive strength. Variations to the time of removal are listed below subject to the concrete reaching its specified compressive strength:
 - a. Dependent on weather conditions.
 - 1) Due to excessive cold weather for a long duration of days, and subject to the Architect's approval, the time for removal may be extended if deemed necessary.
 - b. Dependent on cylinder test results.
 - c. Dependent on recommendations of additive manufacturer when additives are admitted to the mix.
 - d. Typically (verify with three statements above before initiating the following):
 - 1) Foundation Side Forms: Five (5) days after concrete is poured.
 - 2) Wall Forms: Ten (10) day after concrete is poured.
 - 3) Column Forms: Ten (10) days after concrete is poured.
 - 4) Beam, Slab and Joist Soffit Forms:
 - a) Twenty-One (21) days after concrete is poured.
 - b) Re-shore as required to support dead loads and any construction loads applied.
 - e. Remove forms in a manner that will not harm concrete. Do not hammer or pry against concrete.
3. Nails, tie wires and form ties shall be cut off flush with face of concrete.
4. Snap type spreaders to be snapped off inside the wall surface.
5. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release compound as specified for new formwork.
6. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to the Architect.

B. Site Tolerances:

CONCRETE FORMWORK

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1. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 "Guide to Formwork for Concrete" limits:
 - a. Provide Class A tolerances (permitted irregularities are 1/8" in 10' for both gradual and abrupt) for all concrete surfaces exposed to view, or surfaces that will receive additional applied finishes.
2. Concrete work out of alignment, or level or plumb exceeding the allowable tolerance will be cause for rejection of the whole work affected. Such work shall be removed and replaced as directed by Architect with no additional cost to Owner.

3.5 CLEANING

- A. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Re tighten forms and bracing before placing concrete, as required, to prevent leakage of cement paste and maintain alignment.
- B. Remove all wood used for formwork from trenches. No wood shall be left buried in the earth.
- C. Final cleaning shall be in accordance with Specification Section – PROJECT CLOSEOUT.

END OF SECTION

SECTION 03 15 14 – DRILLED ANCHORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all Drilled Anchor materials, labor, equipment and services necessary for Expansion, Adhesive, and Screw Anchors in Concrete, and Concrete Masonry Units, and related items necessary to complete the Project as indicated by the Contract Documents unless otherwise specifically excluded.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 11 01 CONCRETE FORMWORK
 - 4. 03 20 00 REINFORCEMENT
 - 5. 03 30 00 CAST-IN-PLACE CONCRETE
 - 6. 05 12 00 STEEL AND FABRICATIONS
 - 7. 06 10 00 ROUGH CARPENTRY
 - 8. 06 41 23 MODULAR CASEWORK
 - 9. 09 22 16 METAL FRAMING
 - 10. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 11. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data.
 - a. Submit manufacturer's product data for all expansion and adhesive anchors to be used in this project.
 - 1) Submit current ICC Evaluation Services research or evaluation reports evidencing maximum allowable shear and withdrawal load data.
 - 2. Quality Assurance / Control Submittals:
 - a. Test Reports: Submit to DSA, copy to Project Inspector and Contractor.
 - 1) Tension Testing as required.
 - 2) Torque Testing as required.

1.3 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. To ensure consistent quality of anchorage, obtain drilled anchors from a single manufacturer.
 - 2. To ensure consistency of anchorage, obtain adhesive for anchorage from a single manufacturer.
- B. Manufacturer Qualifications: Provide drilled and adhesive anchors from a manufacturer that can demonstrate ICC approvals that are current and acceptable to review by the DSA/SSS.
- C. In accordance with Specification Section - REGULATORY REQUIREMENTS and the following:
 - 1. ICC International Code Council.
 - 2. IR Interpretation of Regulations.
- D. Job Testing: For verifying satisfactory installation workmanship, an independent laboratory will perform proof load tests of drilled anchors acting in tension or shear in the presence of the Project Inspector.
 - 1. When drilled-in expansion-type anchors or other post-installed anchors acceptable to the enforcement agency are used in lieu of cast-in-place bolts, the allowable shear and

tension values and installation verification test loads shall be acceptable to the enforcement agency.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original, unopened packages with manufacturer's labels identifying products legible and intact.
- B. Store materials inside, under cover and in a manner to keep them dry, protected from the weather, surface contamination, corrosion, damage from construction traffic and other causes.

1.5 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period: One (1) Year.
- C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES.
 - a. Warranty Period: One (1) Year.

PART 2 - PRODUCTS

2.1 GENERAL

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Provide manufacturers standard drilled anchors (expansion or adhesive) for installation into Concrete or Concrete Masonry Units unless noted otherwise.
 - 1. Metal Finishes (corrosion resistant):
 - a. Zinc Plated Carbon Steel.
 - b. Stainless Steel.

2.3 EXPANSION ANCHORS

- A. Specified product manufacturer: HILTI INC.
 - 1. Acceptable alternative manufacturer, subject to compliance with requirements:
 - a. DEWALT/POWERS.
 - b. SIMPSON.
- B. Wedge Anchors: The WEDGE category features a small split expansion ring installed on a tapered (integral cone) part of the stud at the bottom. As the nut is tightened, withdrawing the stud portion from the hole, the expansion ring engages the concrete and is further expanded on the tapered part of the stud.
- C. Sleeve Anchors: The SLEEVE category is similar to the wedge except a large expansion sleeve is used instead of a small expansion ring. The outside of the sleeve defines the anchor diameter with the threaded stud being of a smaller diameter since it fits inside the sleeve. The stud has an integral cone expander at the bottom similar to the wedge category. The expansion mechanism is similar to the wedge category except the top of the sleeve is normally in contact with the

nut/washer and is initially forced down over the cone expander as the anchor is tightened. As the sleeve is expanded, it engages the concrete and continues to expand as the wedge anchor.

- D. Shell Anchors: The SHELL category has the most variations, but all use a tapered cone expander, either internal or external, to expand the shell of the anchor against the hole. The anchor is either hammered down over an external expander or a special tool is used to drive an internal expander further into the anchor.

2.4 ADHESIVE ANCHORS

- A. Specified product manufacturer: HILTI INC.
 - 1. Acceptable alternative manufacturer, subject to compliance with requirements:
 - a. DEWALT/POWERS.
 - b. SIMPSON.
- B. Adhesive Anchors which chemically bonds Steel Rods or Deformed Steel Reinforcement Dowels to concrete or masonry elements:
 - 1. Threaded Steel Rods with minimum yield strength of 36 ksi and complying with ASTM A36 "Specification for Carbon Structural Steel," or ASTM A193 "Specification for Alloy-Steel and Stainless Steel Building Materials for High Temperature or High Pressure Service and Other Special Purpose Applications," Grade B7.
 - 2. Deformed Steel Reinforcement Dowels shall be a minimum of Grade 60 and comply with ASTM A615 "Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement" or ASTM A706 "Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement."
 - 3. Adhesives, consisting of two primary components that are stored separately, and having a mixing nozzle provided by the manufacturer combining the components prior to placing in the holes.
 - 4. Long term durability and stability of the adhesive anchor material and its resistance to loss of strength and chemical change at elevated temperatures shall be established to the satisfaction of the enforcement agency.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordination:
 - 1. Coordinate and provide anchors and installation instructions from the manufacturer for items to be embedded in Concrete or Concrete Masonry Unit construction. Manufacturer's written installation instructions shall be available on the project site.

3.2 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices where necessary for securing designated items indicated on the drawings, or as necessary for a complete and proper job to in-place construction.
 - 1. Install the anchors in accordance with the requirements given in the ICC Evaluations Services Report recommendations for the specific anchor used.
 - 2. When installing expansion anchors through metal deck into concrete, the anchors should be installed in the center of the low flute of the decking where practicable in minimum 20 gage deck.
 - a. The minimum depth of embedment shall be 1-1/2 inches above the top flute of the decking (except 1/4 and 5/16-inch diameter anchors for ceilings) when the slab thickness above the top of the flute is at least 3 inches.
 - b. Shell type anchors shall not be used on the underside of concrete and metal deck construction due to damage caused to the concrete when hammering in the shell anchors.

3. Install Adhesive Anchors by placing adhesive into specially prepared holes, then insert rods or dowels into holes in a manner that disperses the adhesive to assure maximum contact between adhesive, surface of the holes and surface of the anchor.
 - a. Adhesive anchors shall not be used in overhead applications.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling and fitting required for designated items of construction. Set work accurately in location, alignment and elevation, level true and free of rack, measured from established lines and levels.
 1. The minimum edge distance and spacing of wedge and adhesive anchors shall not be less than ten (10) diameters or as required by ICC Evaluation Service Report unless specifically shown on drawings.
- C. Use care and caution to avoid cutting or damaging reinforcing bars in Reinforced Concrete or Concrete Masonry Construction.
- D. Do not install expansion or adhesive anchors in recently placed concrete which has not had a minimum 28 day curing period and which has not been accepted as having a minimum compressive strength of 3000 psi.

3.3 FIELD QUALITY CONTROL

- A. Testing, General:
 1. Perform testing in accordance with ACI 318 "Building code Requirements for Structural Concrete and Commentary," and herein specified.
 - a. When expansion or adhesive anchors are listed for sill plate bolting applications, 10 percent of the anchors shall be tested.
 - b. When expansion or adhesive anchors are used for other structural applications, all such anchors shall be tested.
 - 1) Expansion-type anchors shall not be used as hold-down bolts.
 - c. When expansion or adhesive anchors are used for nonstructural applications such as equipment anchorage, 50 percent or alternate bolts in a group shall be tested, except that if the design load is less than 75 pounds, only one anchor in ten need be tested. See drawings for items weighing 75 pounds or less.
 - 1) The testing of the anchors shall be done in the presence of the Project Inspector and a report of the test results shall be submitted to the enforcement agency.
 2. When expansion anchors are used for ceiling hanger wires, 1 out of 10 must be field tested for 200 pounds of tension per IR 25-2.
 - a. When expansion anchors are used for ceiling bracing wires, 1 out of 2 must be field tested for 440 pounds in tension.
 - b. Test ceiling anchors with wires attached.
 3. The proof load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, calibrated spring-loading devices, etc.
 4. If any anchor fails testing, test all anchors of the same category not previously tested until twenty (20) consecutive pass, then resume the initial testing frequency.
 - a. The cost of any additional testing as a result of failures shall be the responsibility of the Contractor at no additional cost to the Owner.
 5. When a drilled-in adhesive anchor is used in lieu of a required cast-in-place bolt, cost of testing shall be the responsibility of the Contractor at no additional cost to the Owner.
- B. Testing:
 1. Expansion Anchors:
 - a. Anchor diameter refers to the thread size for the WEDGE & SHELL categories, and to the anchor outside diameter for the SLEEVE category and Adhesive anchors.
 - b. Apply proof test loads to WEDGE & SLEEVE anchors without removing the nut if possible. If not, remove nut & install a threaded coupler to the same tightness of the original nut using a torque wrench & apply load.

- c. For SLEEVE/SHELL internally threaded categories, verify that the anchor is not prevented from withdrawing by a baseplate or other fixtures. If restraint is found, loosen and shim or remove fixture(s) prior to testing.
 - d. Reaction loads from test fixtures may be applied close to the anchor being tested, provided the anchor is not restrained from withdrawing by the fixture(s).
 - e. SHELL type anchors shall be tested as follows:
 - 1) Visually inspect 25 percent for full expansion as evidenced by the location of the expansion plug in the anchor body.
 - a) Plug location of a fully expanded anchor shall be as recommended by the manufacturer, or, in the absence of such compensation, as determined on the job site following the manufacturer's written installation instructions.
 - b) At least 5 percent of the anchors shall be proof loaded as indicated in the Test Values schedule on the drawings, but not less than three anchors per day for each different person or crew installing anchors. or;
 - c) Test installed anchors per ACI 318 "Building code Requirements for Structural Concrete and Commentary."
2. Adhesive Anchors:
- a. Adhesive anchors shall be tension tested. The tension test load shall equal one and one-quarter (1 1/4) times the maximum design strength of the anchor as determined in compliance with ACI 318 Chapter 17 and the anchors evaluation report, or 80 percent of the yield strength of the bolt (0.8AbFy), whichever is less.
 - 1) The test procedure for expansion-type anchors in the test values table shall also be used for the adhesive anchors.
 - b. Where adhesive anchors are used as shear dowels across cold joints in slabs-on-grade and the slab is not part of the structural system, testing of those dowels is not required.
 - c. Anchors shall exhibit no discernible movement during the tension test.
3. Test equipment (including torque wrenches) is to be calibrated by an approved testing laboratory in accordance with standard recognized procedures.
- a. Alternate torque test procedures and test values for SHELL type anchors may be submitted to the enforcement agency for review and approval on a case-by-case basis when test procedures are submitted and approved by the enforcement agency.
4. The following criteria apply for the acceptance of installed anchors:
- a. HYDRAULIC RAM METHOD: The anchor should have no observable movement at the applicable test load[. For wedge and sleeve type anchors, a practical way to determine observable movement is that the washer under the nut becomes loose].
 - b. TORQUE WRENCH METHOD: The applicable test torque must be reached within the following limits:
 - 1) Wedge or Sleeve Type: One-half (1/2) turn of the nut.
 - a) One-quarter (1/4) turn of the nut for the 3/8 inch sleeve anchor only.
 - 2) Torque testing of adhesive anchors is not permitted.
5. If the manufacturer's recommended installation torque is less than the test torque note in the table, the manufacturer's recommended installation torque shall be used in lieu of the tabulated values.
6. Testing should occur 24 hours minimum after installation of the subject anchors.
7. Required Maximum Test Values for Concrete, or Concrete Masonry Units in tension for the ranges and sizes of Drilled Anchors are shown on the drawings.

END OF SECTION

SECTION 03 20 00 – REINFORCEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all reinforcement material, labor, equipment and services necessary to completely install all reinforcing materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 11 01 CONCRETE FORMWORK
 - 4. 03 15 14 DRILLED ANCHORS
 - 5. 03 30 00 CAST-IN-PLACE CONCRETE
 - 6. 05 12 00 STEEL AND FABRICATIONS
 - 7. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 8. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 REFERENCES

- A. The following References and Manufacturer's Standards shall apply to this Specification Section:
 - 1. ACI American Concrete Institute
 - 2. ASTM American Society for Testing and Materials
 - 3. AWS American Welding Society
 - 4. CRSI Concrete Reinforcing Steel Institute

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data:
 - a. Manufacturer's specification and installation instructions for splice devices.
 - 1) Bar supports.
 - 2. Shop Drawings
 - a. Detail in accordance with ACI 315 "Details and Detailing of Concrete Reinforcing."
 - b. 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 Contractor. Identify such shop drawings with reference thereon to sheet and detail numbers from Contract Drawings.
 - 1) Do not use scaled dimensions from Contract Drawings in determining the lengths of reinforcing bars.
 - 2) No reinforcing steel shall be fabricated without approved shop drawings.
 - 3) One of the required submittal copies shall be reproducible transparency.
 - 4) Any deviations from the contract documents must be clearly indicated as a deviation on the shop drawings.
 - 5) 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.
 - c. Certificates of Compliance with specified standards:
 - 1) Reinforcing Bars.
 - 2) Welded wire fabric.
 - 3) Welding electrodes.
 - 3. Samples

- a. Only as requested by Architect.
- 4. Quality Assurance/Control Submittals:
 - a. Test Reports - Testing Laboratory shall submit to DSA/SSS, Project Inspector, Architect, Structural Engineer and the Contractor one (1) copy of each report showing results of test.
 - 1) 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 A 615 "Specification for Deformed and Plain Carbon-Steel Bars for Structural Concrete."
 - 2) Testing Laboratory reinforcement tests in accordance with CBC Table 1705A.2.1, CBC Section 1910A, and the provisions of Specification Section - TESTING LABORATORY SERVICES.
 - 3) Owner will pay for tests of samples taken from identified bundles accompanied by mill analysis.
 - b. Certificates of Compliance with specified standards:
 - 1) Reinforcing bars.
 - 2) Welded wire fabric.
 - 3) Welding electrodes.
 - 4) Welder's Certification.
- 5. Closeout Submittals:
 - a. Project Record Documents in accordance with Specification Section - PROJECT DOCUMENTS.
 - b. Warranty.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications:
 - a. 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.
 - 2. Welding Qualifications:
 - a. Welding procedures, welding operators and welders shall be qualified in accordance with AWS D1.4 - "Structural Welding Code Reinforcing Steel."
 - b. Welders shall be recently qualified by Test as prescribed in AWS "Standard Qualifications Procedure."
 - 1) Welders whose work fails to pass inspection shall be re-qualified before performing further welding.
 - 3. Manufacturer/Supplier Qualifications:
 - a. Acceptable Manufacturers/Suppliers shall be regularly engaged in the manufacture of steel bar and wire fabric reinforcing.
 - 4. Testing Laboratory will be approved by DSA/SSS, and selected by the Architect and the Owner.
- B. Regulatory Requirements:
 - 1. In accordance with Specification Section – REGULATORY REQUIREMENTS.
 - 2. General:
 - a. Reinforcement work shall conform to ACI 301 "Specifications for Structural Concrete for Buildings," and CBC Section 1905A as minimum standards.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, handling, and unloading:
 - 1. Deliver reinforcement to Project plainly tagged, completely fabricated and ready to set.
- B. Storage and protection:
 - 1. Store reinforcement above the ground surface on platforms, skids or other supports, protected from dirt, rust, or other substances which will prevent bonding to the concrete.
 - 2. Use all necessary care to maintain identification after bundles are taken apart.

1.6 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period: One (1) Year.
- C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES.
 - a. Warranty Period: One (1) Year.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Deformed Bars: In accordance with ASTM A 706 "Low Alloy Steel Deformed Bars for Concrete Reinforcement" and ASTM A 615 "Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement," Grade as indicated on the structural drawings.
- B. Tie Wire: In accordance with ASTM A 82 "Cold Drawn Wire for Concrete Reinforcement," plain, cold-drawn steel.
- C. Spirals: Smooth round in accordance with ASTM A 615 "Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement," or cold drawn ASTM A82 "Cold Drawn Wire for Concrete Reinforcement."
- D. Welded Wire Fabric: In accordance with ASTM A 1064 "Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete."
- E. Steel Dowels: Same grade as bars to which dowels are connected.

2.2 ACCESSORIES

- A. Supports for Reinforcement: Provide bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening, deformed bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.
 - 1. Supports and spacing of spacers per standards set forth by CRSI/WCRSI Manual of Standard Practice.
 - 2. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are protected by plastic [color to match adjacent concrete surfaces] in accordance with CRSI Class I, or stainless steel in accordance with CRSI, Class II.
- B. Welding Electrodes: As per AWS D1.4 "Structural Welding Code for Reinforcing Steel."
- C. Mechanical Couplers: Mechanical Couplers shall develop 125 percent of the specified yield strength of the bars, and shall comply with ACI 318 "Building Code Requirements for Structural Concrete and Commentary," Section 12.14.3.

2.3 FABRICATION

- A. Bending: In accordance with ACI 318 "Building Code Requirements for Structural Concrete and Commentary," except as modified by CBC Sections 1905A.
 - 1. Fabricate reinforcement in accordance with the requirements of ACI 315 "Details and Detailing of Concrete Reinforcement," where specific details are not shown.
 - 2. Inside diameter of bends for stirrups and ties shall not be less than 1-1/2 inches for No. 3 bars, 2 inches for No. 4 bars and 2-1/2 inches for No. 5 bars.
 - 3. Where bent bars are straightened: field bending of bars will only be done in accordance with DSA/SSS approval per ACI 318 "Building Code Requirements for Structural Concrete and Commentary," Section 7.3.2. Steel reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the drawings shall not be used. Heating of bars will not be permitted.
 - 4. Provide offsets in rebar (1:6 maximum) where required to maintain clearances.

- B. Column ties shall terminate with a minimum turn of 135 degrees plus an extension of at least 6 bar diameters but not less than 4 inches at the free end of bar.
- C. Allowable Tolerances:
 - 1. Fabrication:
 - a. Sheared length: 1 inch.
 - b. Depth of truss bars: Plus 0, minus 1/2 inch.
 - c. Ties: Plus or minus 1/2 inch.
 - d. All other bends: Plus or minus 1 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Placing:
 - 1. Place Reinforcement accurately.
 - 2. Do not move bars beyond allowable without concurrence of the Architect.
 - 3. Do not heat, bend, or cut bars without concurrence of the Architect.
 - 4. Reinforcement shall not be bent after being embedded in hardened concrete.
 - 5. Tie Reinforcement together at all intersections with Tie Wire.
 - 6. Support Reinforcing Bars by bar supports. Place and secure in accordance with CRSI "Specifications for Placing Bar Supports."
 - 7. Placement and support shall be complete.
 - 8. Do not use Reinforcing Bars with kinks or bends except when detailed on the structural drawings.
 - 9. Architect shall approve placement and support before concrete is deposited.
 - 10. Spiral reinforcing shall comply with ACI 318 "Building Code Requirements for Structural Concrete and Commentary."
- B. Spacing:
 - 1. Clear space between parallel Reinforcing Bars shall not be less than 1 bar diameter nor less than 1 inch, unless otherwise noted on drawings.
- C. Splicing:
 - 1. At splices, lap Reinforcing Bars 53 diameters minimum, unless otherwise indicated on Drawings.
 - a. Lap Splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
 - b. Splice Devices: Install in accordance with manufacturer's written instructions.
 - 1) Obtain the Architect's review before using.
 - c. Do not splice bars except at locations shown without the concurrence of the Architect.
 - 1) Where splices in addition to those indicated are required, indicate location on shop drawings clearly and highlight "for the Architect's approval."
 - 2. Stagger splices as indicated on drawings. Splice locations shall be as shown on drawings or shall be approved by Architect and DSA/SSS.
 - a. Near floors.
 - b. Ductile concrete columns must splice at the centerline of the column height.
 - c. As detailed on the drawings.
 - 3. Where vertical Reinforcing Bars are offset at a splice, the slope of the inclined portion of bar with the axis of the column or wall shall not exceed 1 in 6.
 - 4. Welded Wire Fabric:
 - a. Install in long lengths, lapping 24 inches at end splices and one mesh at side splices.
 - b. Offset laps in adjacent widths.
 - c. Place fabric in approximately the middle of the slab thickness unless otherwise shown on the drawings.
 - d. Wire tie lap joints at 12 inch centers.
 - e. Use concrete blocks to support mesh in proper position.

5. Mechanical bar splices shall be approved by the Architect and DSA/SSS.
- D. Welding:
 1. Welding is not permitted unless specifically detailed on Drawings or approved by the Architect.
 2. Weld under supervision of qualified Testing Laboratory selected by Owner. Cost of supervision to be paid by the Owner. Weld only ASTM A706 "Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement," unless otherwise noted.
 3. Employ shielding metal-arc method and meet requirements of AWS D1.4 "Structural Welding Code for Reinforcing Steel."
 4. Welding is not permitted on bars where carbon equivalent is unknown or is determined to exceed 0.55.
 5. Welding shall not be done within two bar diameters of any bent portion of a bar which has been bent cold.
 6. Welding of crossing bars is not permitted.
 7. Provide material properties supplemental report for bars other than ASTM A706 "Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement."
 8. Weld in accordance with AWS D1.4 "Structural Welding Code for Reinforcing Steel."
 - a. Weld only where indicated on the drawings.
 - b. Weld only ASTM A706 "Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement," unless otherwise approved by the Architect and DSA/SSS.
 9. Inspection provided per CBC Table 1705A.3.
- E. Allowable Tolerances:
 1. Placement:
 - a. Concrete cover to form surfaces: Plus or minus 1/4 inch.
 - b. Minimum spacing between bars: Plus or minus 1/4 inch.
 - c. Crosswise of members: Spaced evenly with 2 inches of stated separation.
 - d. Lengthwise of members: Plus or minus 2 inches.
 2. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 2 bar diameters.
- F. Drawing Notes: Refer to notes on drawings for additional reinforcement requirements.
- G. Mechanical, Electrical and Plumbing Drawings:
 1. Refer to Mechanical, Electrical and Plumbing drawings for formed concrete requiring reinforcing steel.
 2. All such steel shall be included under the work of this section.

3.2 CONSTRUCTION

- A. Corrective Measures:
 1. Notify Architect if conduit, piping, inserts, sleeves, etc. interfere with placement of Concrete Reinforcement as indicated on Drawings. Notify Architect immediately if any Concrete Reinforcement is found to be misplaced after concrete has been poured.
 2. Do not cut, bend, kink or hickey misplaced reinforcement.
 3. Make corrections only as directed by Architect and approved by DSA/SSS.
 4. This Contractor shall bear the cost of any alteration, corrections or replacements of Concrete Reinforcing to concrete required because of misplaced reinforcement.

3.3 FIELD AND QUALITY CONTROL

- A. Site Tests:
 1. When inspections are indicated for reinforcement placement on the Structural drawings, a special inspector shall be employed to inspect reinforcing placement per CBC Table 1705A.3.
 2. Inspect shop and field welding in accordance with AWS D1.4 "Structural Welding Code for Reinforcing Steel," including checking materials, equipment, procedure and welder

qualifications 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. Inspections:

1. All reinforcing steel whose properties are not identifiable by mill test reports shall be tested in accordance with ASTM A 706 "Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement." One series of tests shall be performed for each missing report. Contractor shall pay for test required due to lack of positive identification, by means of a back charge by the Owner.
2. When tests are indicated for reinforcing steel on the structural drawings, the reinforcing steel used shall be tested in accordance with ASTM A 615 "Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement." One tensile and one bend test for each 2-1/2 tons of steel or fraction thereof, shall be made.

C. Tests and Inspection shall be performed by Owner's Testing Laboratory except when needed to justify rejected work, in which case the cost of re-tests and re-inspection shall be borne by the Contractor.

3.4 CLEANING

- A. Reinforcement, at time concrete is placed, shall be free of loose rust scale, mud, oil or other coating that will destroy or reduce the bond.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all Cast-In-Place Concrete materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
 - a. Footings.
 - b. Foundation Walls.
 - c. Slab on Grade.
 - d. Slab on Metal Deck.
 - e. Building Walls.
 - f. Site Improvements.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 11 01 CONCRETE FORMWORK
 - 4. 03 15 14 DRILLED ANCHORS
 - 5. 05 12 00 STEEL AND FABRICATIONS
 - 6. 06 10 00 ROUGH CARPENTRY
 - 7. 07 18 50 VAPOR-ALKALINITY CONTROL
 - 8. 07 92 00 SEALANTS
 - 9. 09 22 16 METAL FRAMING
 - 10. 09 30 00 TILE
 - 11. 09 65 10 RESILIENT BASE AND ACCESSORIES
 - 12. 09 67 23 RESINOUS FLOORING
 - 13. 09 68 40 CARPET
 - 14. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 15. 10 14 00 IDENTIFYING DEVICES
 - 16. 32 12 00 PAVEMENT
 - 17. 32 31 13 CHAIN LINK
 - 18. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 19. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. ACI American Concrete Institute
 - b. ASTM American Society of Testing Materials.
 - c. RFCI The Resilient Floor Covering Institute
 - d. RIS Redwood Inspection Service
 - e. RMAI Rubber Manufacturers Association Inc.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Make ready all interior concrete substrates to receive flooring:
 - a. Ensure the proper levelness and flatness of all concrete substrates for the intended flooring products.
 - 1) If leveling materials are required because of inadequate leveling during the pour and curing periods, follow all manufacturers written instructions for the proper preparation and application of these products.

- 2) Verify that the concrete substrates are at the right RH (Relative Humidity) and Alkalinity Levels for the leveling materials in accordance with manufacturers written instructions.
- b. Keep finished concrete substrates clean and ready for scheduled flooring applications during the construction process.
 - 1) Protect those substrates from excessive moisture build-up, and keep free of moisture puddles.
 - 2) Ensure that construction equipment does not leak fluids on substrates that would prevent bonding of flooring adhesives at the proper time for flooring installations.
- c. Provide concrete substrates that are within acceptable limits of RH and that the Alkalinity of the concrete substrates are within the acceptable levels for adhesively applied flooring at the scheduled time for flooring installations.

1.4 SUBMITTALS

A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:

1. Coordination Drawings:
 - a. Layout drawings for construction, control and expansion joints.
 - 1) Coordinate joints with floor patterns.
2. Product Data.
 - a. Submit data on all products listed under MATERIALS, and ACCESSORIES within this specification section.
3. Quality Assurance/Control Submittals:
 - a. Coordinate with Specification Section - TESTING LABORATORY SERVICES for additional Testing Requirements as required by DSA.
 - b. Material samples and mix designs:
 - 1) Material samples and mix designs as required for testing shall be submitted to Architect at least fourteen (14) days prior to any concrete work and shall include results of test data used to establish proportions.
 - a) Grout samples and colors for colored surfaces upon Architect's request only.
 - c. Continuous batch plant inspection required per CBC Section 1705A.3.3, or may be waived per CBC Section 1705A.3.3.
 - d. Continuous Batch Plant Inspection is waived for this project in compliance with CBC Section 1705A.3.3, subject to the following requirements:
 - 1) The concrete plan complies fully with the requirements of ASTM C94, Sections 9 and 10, and has a current certificate from the National Ready Mixed Concrete Association or another agency acceptable to the [DSA][HCAI][AHJ]. The certification shall indicate that the plant has automatic batching and recording capabilities.
 - 2) A licensed Weighmaster shall positively identify the quantity of materials and certify each load with a batch ticket.
 - 3) Batch tickets shall accompany the load and be transmitted to the Inspector of Record by the truck driver with the load identifies thereon. The load shall not be placed without a batch ticket identifying the mix. The Inspector of Record shall keep a daily record of placements, identifying each truck, its load, and the time of receipt at the jobsite, and approximate location of deposit in the structure. A copy of the daily record shall be maintained.
 - e. Test Reports:
 - 1) Testing Laboratory shall submit to Architect, Structural Engineer, Owner, and to the DSA one (1) copy of each report showing results of tests.
 - a) Report shall state whether materials were in conformance with specifications.
 - b) Report shall state whether the curing of the concrete slabs are within parameters required for future flooring installations.

- 2) Moisture and Alkalinity Tests.
 - a) Relative Humidity (RH).
 - b) Moisture Vapor Emission Report (MVER).
- f. Certificates:
 - 1) Submit three (3) copies of certificates.
 - a) Provide Vapor Retarder manufacturer's certificate of inspection and compliance to installation procedures.
 - b) Cement manufacturer's Mill Certificate of Compliance with the specification.
 - c) Certificates for aggregates and admixtures.
- 4. Closeout Submittals:
 - a. Project Record Documents in accordance with Specification Section - PROJECT DOCUMENTS.
 - b. Warranty.

1.5 QUALITY ASSURANCE

A. Qualifications:

- 1. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
- 2. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the Work.
- 3. Testing Laboratory Qualifications:
 - a. Qualified Testing Laboratory and personnel approved by DSA.
 - 1) Cost of testing and inspection will be paid by the Owner unless otherwise specified. The Owner shall pay all costs of re-inspection and/or re-tests due to non-compliance with specifications and/or failures, but the Contractor shall reimburse the Owner for these tests when billed or deducted from its payment.

B. Regulatory Requirements:

- 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. All materials, equipment and placing operations shall be subject to inspection, tests and approval at all items. Testing Agent shall have free and unhampered access to all places where concrete materials are stored proportioned and mixed.

C. Mockups:

- 1. Provide mockups prior to application of work and prior to installation of any materials.
- 2. Mockups shall be used for establishing construction sequences, installation requirements of materials, and shall be representative for the intended end-use configuration.
- 3. Mockup Assemblies:
 - a. Slab on Metal Deck Mockups shall be placement of concrete and shall integrate all other related work, including, but not limited to, Specification Section - REINFORCEMENT.
 - 1) Mockups shall be a minimum overall size of 10'-0" x 8'-0" by thickness required.
 - 2) Placement of concrete shall not displace the reinforcing as to proper height with chairs, tying of reinforcement, and location of reinforcement with relationship to Metal Deck Flutes.
 - b. Polished Concrete Finishing: Mockups shall be the placement of concrete and shall integrate all other related work, but not limited to, Specification Section - POLISHED CONCRETE FINISHING.
 - c. Slab-On-Grade: Mockups shall be the finish and texture of concrete.
 - 1) Mockups shall be a minimum overall size of 3' x 3' x 4" thick panels.

- 2) Provide Mockups for each texture and finish required.
4. Installation of Mockups:
 - a. The Project Inspector, the Architect, and Contractor's Superintendent shall observe the installation of materials and work.
 - b. Installation crew for the Mockups shall be the Cast-In-Place Concrete, Reinforcement and Polished Concrete Finishing installers for this project and installers, as necessary, of other related work.
 - c. Unacceptable Mockups shall be removed and reinstalled until the work is deemed to be in compliance with the project requirements and is acceptable by the Owner, Architect and Project Inspector.
5. Allow 24 hours for inspection of mockup before proceeding with work.
6. Protect the Mockups during the course of construction.
7. Remove mockup and dispose of materials when no longer required and when directed by the Architect at the end of the project.
- D. Meetings:
 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with other related work being performed.
 - 1) Schedule pre-construction conference with Vapor Retarder Manufacturer prior to installation at least one week prior to scheduled installation.
 - 2) Schedule pre-construction conference with Polished Concrete Contractor prior to installation to discuss specific requirements of the Polished Concrete Finishing requirements. Coordinate with Specification Section - POLISHED CONCRETE FINISHING.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - c. Prior to submitting design mixes, review detailed requirements for preparing concrete design mixes and determine procedures for satisfactory concrete operations.
 - d. Review requirements for submittals, status of coordinating work, and availability of materials.
 - e. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications.
 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - 1) Schedule installation review at the start of installation with the Vapor Retarder Manufacturer to ensure all of the manufacturers written instructions are complied with.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - 1) Prior to covering up the Vapor Retarder installation with concrete, have the Vapor Retarder manufacturer inspect and provide a certified report to the Architect the condition of the Vapor Retarder prior to being covered with concrete, and that the installation was in full compliance with the manufacturer's written instructions.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.6 PROJECT CONDITIONS

A. Environmental requirements:

1. Cold Weather Requirements:

- a. Do not pour concrete unless air temperature is at least 40 degrees Fahrenheit and rising.

- b. Do not pour concrete on frozen ground or ice.
 - c. Heat and otherwise prepare materials in accordance with ACI Standard 306.
 - d. Maintain concrete temperature at 50 degrees Fahrenheit (minimum) the first three (3) days after pouring. Protect concrete from freezing the first six (6) six days, after placing.
2. Hot Weather Requirements:
- a. Do not pour when temperature exceeds 90 degrees Fahrenheit.
 - b. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive Concrete temperatures or water evaporation, which will impair the required strength or serviceability of the member or structure.

1.7 WARRANTY

- A. Contractor's General Warranty: In accordance with Specification Section – WARRANTIES.
- B. Manufacturer's Warranty, in accordance with manufacturer's written standard warranty:
 - a. Warranty Period: One (1) Year.
- C. Installer's Warranty, in accordance with Specification Section – WARRANTIES.
 - a. Warranty period: One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 CONCRETE MATERIALS

- 1. Cement: Type I or II in accordance with ACI 318 "Building Code Requirements for Structural Concrete and Commentary," Chapter 3, and ASTM C 150 "Specifications for Portland Cement."
 - a. Natural (Grey) Portland Cement:
 - 1) LEHIGH PORTLAND CEMENT COMPANY.
 - 2) MARTIN MARIETTA (TXI CEMENT COMPANY).
 - b. White Cement:
 - 1) LEHIGH WHITE CEMENT
 - 2) MARTIN MARIETTA (TXI CEMENT COMPANY).
 - c. Provide white cement for mixing when the Project requires patching for defective work, to match adjacent material color. See Specification Section - CAST-IN-PLACE CONCRETE, Part 3 Article titled "APPLICATIONS," the paragraph titled "Sack Finish."
- 2. Water: Clean and free from deleterious amounts of acids, alkalis, salts, organic material, or other substances that may be deleterious to concrete or reinforcing.
- 3. Aggregates:
 - a. Normal weight aggregates in accordance with ACI 318 "Building Code Requirements for Structural Concrete and Commentary," Chapter 3 and ASTM C33 "Standard Specifications for Concrete Aggregates." Crushed Granite or "Perkins" type aggregates are acceptable materials.
 - 1) Maximum Aggregate Size: 1-1/2 inches for standard aggregate.

- 2) Coarse aggregate when tested in accordance with State of California Highways Test Methods 227 shall have a cleanliness value of 75 minimum.
- 3) Fine aggregates when tested in accordance with State of California Highways Test Methods 217 shall have a sand equivalent of 75 minimum.
- b. Lightweight aggregates shall be expanded shale, vacuum saturated or thermal quenched, and shall be in accordance with ACI 318 "Building Code Requirements for Structural Concrete and Commentary," Chapter 3, and ASTM C 330 "Standard Specification for Lightweight Aggregates for Structural Concrete."
 - 1) Maximum Aggregate Size: 3/4 inches for lightweight aggregates.
 - 2) Shrinkage control: Aggregate shall be prepared within 72 hours of being used or be re-wetted for 1/2 hour, twice a day if longer storage is required at the plant.
4. Admixtures: Admixtures shall be in accordance with the provisions of ACI 318 "Building Code Requirements for Structural Concrete and Commentary," Section 3.6, and shall not be used until prior approval from DSA has been obtained. Calcium Chloride is not permitted.
 - a. Air Entraining:
 - 1) Conform to ASTM C 260 "Specifications for Air-Entraining Admixtures for Concrete."
 - b. Fly Ash:
 - 1) Conform to ASTM C 618 "Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete."
 - 2) Class "C" Fly Ash is not permitted per CBC 1903A.6.
 - c. Water Reducing, High Range: On approval of DSA, the Architect and the Structural Engineer, the Contractor may use a High Range Water Reducing Admixture complying with ASTM C 494 "Specification for Chemical Admixtures for Concrete." Use one of the following materials:
 - 1) Finish Enhancing Water Reducer; "ADVA 170" by GCP APPLIED TECHNOLOGIES.
 - 2) ASTM C 494 "Specification for Chemical Admixtures for Concrete," Type F.
 - d. Fiber Reinforcing:
 - 1) Polypropylene / polyethylene macro synthetic fiber, complying with ASTM C 1116 "Standard Specification for Fiber Reinforced Concrete and Shotcrete."
 - 2) Specified product manufacturer: THE EUCLID CHEMICAL COMPANY.
 - a) TUF-STRAND SF.
 - 3) Suitable for Slab On Grade and Above Grade Slab Construction.
 - 4) UL Certified for composite metal deck construction.
 - e. Integrally Colored Concrete Color Pigment:
 - 1) ASTM C 979 "Specification for Pigments for Integrally Colored Concrete," synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
 - 2) Specified product manufacturer: DAVIS COLORS.
 - 3) Acceptable alternative product manufacturers:
 - a) SOLOMON COLORS.
 - f. Shrinkage Control:
 - 1) Conform to ASTM C 494 "Specification for Chemical Admixtures for Concrete," Type S.
 - 2) Specified product manufacturer: SIKA CONTROL-40.
 - 3) Acceptable alternative product manufacturer:
 - a) THE EUCLID CHEMICAL COMPANY: "Eurcon SRA Floor".

- 4) Verify and provide Shrinkage control compatible with Polished Concrete Finishing.
- g. Integral Concrete Waterproofing:
 - 1) Crystalline Waterproofing: Prepackaged, gray-colored proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates into concrete and reacts chemically with the byproducts of cement hydration in the presence of water to develop crystalline growth within substrate capillaries to produce an impervious, dense, waterproof substrate.
 - 2) Specified product manufacturer: XYPEX.
 - a) ADMIX C-500.

2.3 SLAB ON GRADE BASE MATERIALS

A. Rock Base:

1. Clean mixture of crushed stone or uncrushed gravel, in accordance with ASTM D 448 "Standard Classification for Sizes of Aggregate for Road and Bridge Construction."
 - a. Top Layer:
 - 1) Percent passing a 1-inch sieve: 100 percent.
 - 2) Percent passing No. 8 sieve: 0 to 5 percent.
 - b. Bottom Layer:
 - 1) Percent passing a 2-inch sieve: 100 percent.
 - 2) Percent passing No. 8 sieve: 0 to 5 percent.

B. Sand Base:

1. Sand to be washed and of natural siliceous or igneous origin, having hard, strong, and durable particles.
2. Sand shall comply with ASTM C 33 "Specification for Concrete Aggregates," generally as follows:
 - a. Percent passing 3/8 inch sieve: 100 percent.
 - b. Percent passing No. 4 sieve: 95 to 100percent.
 - c. Percent passing No. 50 sieve: 10 to 30 percent.
 - d. Percent passing No. 100 sieve: 2 to 10 percent.

2.4 VAPOR RETARDER

A. Vapor Retarder: Physical Requirements in accordance with ASTM E 1745 "Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs," Class A Material, are as follows:

1. Thickness: 15 mils minimum.
2. Permeance: 0.01 Perms.
 - a. Maintain permeance of less than 0.01 perms after mandatory conditioning tests per ASTM E 154 "Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover," Sections 8, 11, 12, and 13.
3. Tensile Strength: 45.0 lbf/in.
 - a. Per ASTM E 154 "Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover," Sec. 9, ASTM D 828 "Standard Test Method for Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus:"
4. Resistance to Puncture: 2200 grams.
 - a. ASTM E 154 "Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover", Sec. 10, ASTM D 1709 "Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method:"
5. Resistance to decay:
 - a. Per ASTM E 154 "Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover."

6. Use pressure sensitive seam tape compatible with materials to be seamed in accordance with manufacturer's written recommendations.
 - a. Water vapor Transmission Rate: 0.3 perms or lower.
 - 1) Per ASTM E 96 "Test Methods for Water Transmission of Materials."
7. Vapor Proof Mastic: 0.3 perms or lower.
 - a. Water vapor Transmission Rate: 0.3 perms or lower.
 - 1) Per ASTM E 96 "Test Methods for Water Transmission of Materials."
8. Pipe Boots: Construct pipe boots from vapor retarder material, pressure sensitive seam tape, and /or mastic per manufacturer's written instructions.
9. Vapor Stakes:
 - a. Density: 0.0289 lb/cu.in.
 - 1) Per ASTM D 1505 "Test Method for Density of Plastics by the Density-Gradient Technique."
 - b. Specific Gravity: 0.0477.
 - 1) Per ASTM D 792 "Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement."
10. Specified product manufacturer: STEGO INDUSTRIES.
 - a. "Stego-Wrap" ("Yellow" color).
 - b. Acceptable alternative product manufacturers:
 - 1) EPRO SERVICES, INC.: "Ecoshield-E15" ("Red" color).
 - 2) W.R. MEADOWS: "Perminator 15" ("Green" color).

2.5 ACCESSORIES

- A. Bonding Agents: Polyvinyl acetate or acrylic base, mixed in accordance with the manufacturer's written recommendations.
 1. Specified product manufacturer: CONRAD SOVIG CO., INC.
 - a. "Cemlok-NE."
 2. Acceptable alternative product manufacturers:

a. THE EUCLID CHEMICAL COMPANY:	"Eucoweld."
b. LARSON PRODUCTS CORPORATION:	"Weld-Crete."
c. SONNEBORN:	"Sonobond."
d. GCP APPLIED TECHNOLOGIES, INC:	"Darweld C."
e. W.R. MEADOWS:	"Deck-O-Weld."
- B. Mortar:
 1. Site Mix:
 - a. Composed of Concrete Materials indicated in Specification Section - CAST-IN-PLACE CONCRETE, Part 2 Article titled "MATERIALS."
 - 1) Mix: One part cement to 3 parts aggregate (all aggregate shall pass No. 4 sieve).
 - 2) Mixing: Thoroughly mixed in accordance with ACI 318 "Building Code Requirements for Structural Concrete and Commentary."
 2. Concrete Mortar:
 - a. Greater than 1/4 inch thick: Floor leveling, patching and repair, non-shrink trowel applied concrete mortar where repair areas of fill.
 3. Epoxy Concrete Mortar:
 - a. Less than 1/4 inch thick: Floor leveling, non-shrink trowel applied epoxy concrete mortar where repair areas to fill.
 - b. Specified manufacturer: GENERAL POLYMER CORPORATION: "TPM 115."
 - c. Acceptable alternative product manufacturer:
 - 1) ANTI-HYDRO CORPORATION: "A-H Emery Epoxy Topping #170."
 4. Epoxy Mortar and Adhesive Materials:
 - a. Modified Polyamide, high modulus mortar, strength to match adjacent concrete or greater, in accordance with ASTM C 881 "Specification for Epoxy-Resin-Base Bonding Systems for Concrete," Grade 1, Type III, Class B & C, and in

accordance with ACI 503.4, mixed in accordance with the manufacturer's written recommendations.

- b. Specified product manufacturer: W.R. MEADOWS.
 - 1) "Rezi-Weld," "LV, 1000" or "Gel-Paste" as suitable for application.
- c. Acceptable alternative product manufacturers:
 - 1) THE EUCLID CHEMICAL COMPANY: "Euco #456."

C. Grout:

- 1. Strength to match adjacent concrete or greater, composed of specified Concrete Materials.
 - a. Mix: Same proportions as concrete mix except omit coarse aggregate and adjust water to produce a thick consistency. Provide mix design per CBC Section 1904A.2.
 - b. Mixing: In accordance with ACI 318 "Building Code Requirements for Structural Concrete and Commentary," mixed in accordance with the manufacturer's written recommendation.
- 2. Non-Shrink Grout: Flowable, non-shrink, self-leveling, non-staining, non-metallic grout, strength to match adjacent concrete or greater, and in compliance with ASTM C 1107 "Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)," mixed in accordance with the manufacturer's written recommendation.
 - a. Specified product manufacturer:
 - 1) MINWAX CONSTRUCTION PRODUCTS COMPANY
 - a) "POR-ROK", Epoxy Grout.
 - b. Acceptable alternative product manufacturers:
 - 1) MASTER BUILDERS: "713."
 - 2) MASTER BUILDERS: "928."
- 3. Drypack Grout: Non-staining, non-shrink, non-metallic grout, strength to match adjacent concrete or greater, and in accordance with ASTM C 1107 "Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)," mixed in accordance with the manufacturer's written recommendation.
 - a. Specified product manufacturer:
 - 1) THE EUCLID CHEMICAL COMPANY: "Euco Dry Pack Grout."
 - b. Acceptable alternative product manufacturers:
 - 1) W.R. MEADOWS: "Pac-It Grout."

2.6 JOINT FILLERS

- A. Waterstops: Provide polyvinyl chloride type waterstops, model number and size to fit the construction required, in accordance with the Corps of Engineers standard CRD-C 572.
 - 1. Specified product manufacturer:
 - a. GREENSTREAK PLASTIC PRODUCTS CO. "Polyvinyl Chloride Type."
- B. Fiber Expansion Joint Filler: 3/8" thick at vertical joints and 1/2" thick under thresholds (unless specifically noted otherwise), asphalt saturated fiber expansion joint filler, in accordance with ASTM D 1751 "Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)." Provide manufacturer's recommended removable expansion joint cap.
 - 1. Specified product manufacturer:
 - a. W.R. MEADOWS: "Fiber Expansion Joint" with "Snap Cap"
 - b. Acceptable alternative product manufacturers:
 - 1) JD RUSSELL CO. "Fiberflex Fiber Expansion Joint Filler" with snap cap.
- C. Semi-Rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240 "Standard Test Method for Rubber Property – Durometer Hardness."
 - 1. Specified product manufacturer:
 - a. W.R. MEADOWS: "Rezi-Weld Flex."

- D. Polished Concrete Joint Filler: A two-component, 100% solids semi-rigid epoxy for filling control and construction joints in industrial concrete floors. This product supports the joint edges and reduces spalling of the edges caused by wheel traffic. EUCO 700 has been designed for use in compliance with ACI 302 recommendations for epoxy joint fillers used in control and construction joints.
 - 1. Specified product manufacturer: EUCLID "Euco 700."
- E. Foam Expansion Joint Filler: Extruded Polystyrene Foam products, in accordance with ASTM C 578 "Specification for Rigid, Cellular Polystyrene Thermal Insulation," thickness and depth as indicated on the drawings.
 - 1. Specified Product Manufacturer:
 - a. DOW CHEMICAL CORP.: "Styrofoam."
 - b. Acceptable alternative product manufacturers:
 - 1) U.C. INDUSTRIES: "Foamular."
- F. Redwood Joint Filler:
 - 1. Selected sound heart redwood in accordance with RIS "Standard Specifications for Grades of California Redwood Lumber," Section 211 (c) and Section 306.

2.7 CAST-IN CONCRETE ELEMENTS

- A. Architectural Letters:
 - 1. Standard or custom Styrofoam insert type in style(s) indicated on the drawings.
 - 2. Specified product manufacturer:
 - a. GLOBAL FOAM COMPANY, Standard or Custom "Styrofoam" insert type.
 - b. Acceptable alternative product manufacturers:
 - 1) GEMINI.
 - 2) HOWMAC.
- B. Stair Nosings, Radiused:
 - 1. Radiused nosings with integral anchors and temporary protective tape.
 - 2. Specified product manufacturer:
 - a. WOOSTER PRODUCTS INC. "SUPERGRIT TYPE 231BF."
 - b. 3" wide x 1/4" thick x 1/4" nose at underside x length and radius as required.
 - c. Suitable for poured concrete and steel pan-concrete filled treads.
 - 1) For poured concrete, install full step length less approximate 3" clearance.
 - 2) For steel pan-concrete filled, install full step length (stringer to stringer) less 1/8" clearance.
 - d. Minimum radius limitation is 3'-0".
 - e. Color of grit strips shall be selected by the Architect from the manufacturer's standard range.
 - f. Nosings shall be installed before "Initial Set" of the concrete or cement occurs.
 - g. Puddle the concrete, tamp the nosings to insure proper concrete formation around the anchors.
 - h. Remove the protective tape as soon as practical.
- C. Stair Nosings, Straight:
 - 1. Straight nosings with integral anchors and temporary protective tape.
 - a. Straight Nosings: "SUPERGRIT TYPE 231BF."
 - b. 3" wide x 1/4" thick x 1/4" nose at underside x length as required.
 - c. Suitable for poured concrete and steel pan-concrete filled treads.
 - 1) For poured concrete, install full step length less approximate 3" clearance.
 - 2) For steel pan-concrete filled, install full step length (stringer to stringer) less 1/8" clearance.
 - d. Color of grit strips shall be selected by the Architect from the manufacturer's standard range.
 - e. Nosings shall be installed before "Initial Set" of the concrete or cement occurs.
 - f. Puddle the concrete, tamp the nosings to insure proper concrete formation around the anchors.
 - g. Remove the protective tape as soon as practical.

D. Pre-Cast Concrete:

1. Stair Cap:
 - a. CDI, or approved equivalent.
 - 1) "GFRC" Texture Finish.
2. Bench:
 - a. QUIKRETE PRODUCTS CORP., or approved equivalent.
 - b. Model #: Contemporary "Modern," #Q2MD60B.
 - 1) 60 inch x 30 inch x 15 inch.
 - c. Material: SRC.
 - d. Color / Finish: Natural.
 - e. Texture: Smooth.
 - f. Sealer: MT (Matte Finish).
 - g. Anchor Bolt: See architectural details.

2.8 CURING MATERIALS

A. Curing Paper (Absorptive Covers): Products complying with:

1. Specified product manufacturer:
 - a. FORTIFIBER CORPORATION: "Orange Label Sisalkraft."
2. ASTM C 171 "Specification for Sheet materials for Curing Concrete."

B. Slab Curing Compound (SCC): Provide liquid-type membrane-forming sealing compound, non-yellowing, VOC compliant cure and seal, complying with ASTM C 309 "Specification for Liquid Membrane-Forming Compounds for Curing Concrete," Type I, Class A, that when dry is clear in color. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq.ft./gal.

1. Specified product manufacturer:
 - a. THE EUCLID CHEMICAL COMPANY: "Cure-Crete WB."
 - b. Acceptable alternative product manufacturers:
 - 1) W.R. MEADOWS: "Sealtight 1100 CLEAR."

C. Clear Floor Sealer (CFS): Provide liquid-type membrane-forming sealing compound, non-yellowing, VOC compliant cure and seal, complying with ASTM C 309 "Specification for Liquid Membrane-Forming Compounds for Curing Concrete," Type I, Class A, that when dry is clear in color. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq.ft./gal.

1. Specified product manufacturer:
 - a. THE EUCLID CHEMICAL COMPANY: "Diamond Clear VOX."
 - b. Acceptable alternative product manufacturers:
 - 1) W.R. MEADOWS: "Sealtight VComp 25."

2.9 FLOOR AND SLAB TREATMENTS

A. Clear Floor Hardener (CFH): Provide products that are ready-to-use, dry-shake type, VOC compliant clear hardeners, with surface conditioning and dispersing agents, portland cement blended with hard, graded aggregate, mixed in accordance with the manufacturer's written recommendations.

1. Specified product manufacturer:
 - a. SIKA CORPORATION: "Emerchrome Clear Floor Hardener."

B. Colored Floor Hardener (COFH): Provide products that are ready-to-use, dry-shake type, VOC compliant colored hardeners, with surface conditioning and dispersing agents, portland cement blended with hard, graded aggregate, mixed in accordance with the manufacturer's written recommendations.

1. Specified product manufacturer:
 - a. SIKA CORPORATION: "Lithochrome Color Hardener" and "Lithochrome Color Sealer."

C. Colored Wear-Resistant Finish (COWR): Provide products that are ready-to-use, dry-shake type, VOC compliant colored hardeners, streak-free integrinds of pigments, with surface conditioning and dispersing agents, portland cement blended with hard, graded aggregate, mixed in accordance with the manufacturer's written recommendations, and then apply a Colored Curing Compound Sealer mixed in accordance with manufacturers recommendations:

1. Provide Manufacturer's Color Hardener.
 2. Provide manufacturer's colored curing compound [**wax**][**sealer**].
 - a. Provide liquid-type membrane-forming sealing compound, VOC compliant cure and seal, complying with ASTM C 309 "Specification for Liquid Membrane-Forming Compounds for Curing Concrete," Type I, Class A, that when dry has the color as selected by the Architect from the manufacturer's full color range. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq.ft./gal, mixed in accordance with the manufacturer's written recommendations.
 - b. Specified product manufacturer:
 - c. SIKA CORPORATION: "Emerchrome Colored Floor Hardener" and "[Lithochrome Color Wax][Colorcure Sealer]."
 - D. Sack Finish Materials: For repair and patching of defective areas.
 1. Provide sack finish materials composed of Concrete Materials indicated in Specification Section - CAST-IN-PLACE CONCRETE, Part 2 Article titled "MATERIALS." Sand shall be fine.
 2. Mix: One part cement to one part fine sand with enough water to provide a creamy consistency.
 - E. Cementitious Based Underlayment Compounds (CBUC): Provide free-flowing, self-leveling, pumpable, cement based compound for applications from 1-1/4 inch thick to feathered edges, 4500 psi minimum in accordance with ASTM C 109 "Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. (or 50-mm) Cube Specimens)."
 1. Specified product manufacturer:
 - a. ARDEX: "V-1200."
 - b. Acceptable alternative product manufacturers:
 - 1) MAPEI: "Ultraflex."
 - 2) QUIKRETE PRODUCTS CORP.: "QUIKRETE No. 1249."
 - F. Stamped Concrete:
 1. General:
 - a. Imprinting tools, forms and mats shall be in accordance with ADA Standards for Accessible Design, Section 4.29.2, CBC Sections 11B-705, and California Government Code Section 4451(d).
 2. Specified product manufacturer: STAMPCRETE INTERNATIONAL.
 3. Stamp Mats: Semi-Rigid polyurethane mats with projected texture and ridged underside capable of imprinting texture and joint patterns to plastic cementitious stampable overlay. Include texture skins matching stamp mat textures for texturing areas that cannot be reached with stamping mats.
- 2.10 TRUNCATED DOMES
- A. General:
 1. Imprinting tools, forms and mats shall be in accordance with ADA Standards for Accessible Design, Section 4.29.2, CBC Sections 11B-705, California Government Code Section 4451(d), and IR 11B-4.
 - B. Cast-In-Place Replaceable Mat:
 1. Specified product manufacturer: ADA SOLUTIONS, INC.
 2. Provide and install cast-in-place mat of homogeneous glass and carbon reinforced composite material.
 3. Provide Integral Uniform Color throughout product, Yellow, approximate 33538 of SAE AMS-STD-595A.
 4. Material Physical Characteristics:

a. Compressive Strength:	greater than 28,000 psi per ASTM D 695.
b. Tensile Strength:	greater than 11,000 psi per ASTM D 638.
c. Water Absorption:	less than 0.10 percent per ASTM D 570.
d. Slip Resistance:	less than 1.00 Wet/Dry Static per ASTM C 1028.
e. Flame Spread Index:	less than 25 per ASTM E 84.
 5. Dimensions: Statistics of Truncated Domes per CBC 11B-705.1:

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- a. Base Diameter of Dome: 0.90 to 0.92 inch.
 - b. Top Diameter of the Dome: 0.45 to 0.47 inch.
 - c. Height of the Dome: 0.2 inch.
 - d. Center to Center Spacing of Domes in-line pattern: 2.3 to 2.4 inches.
 - e. All edges of panel shall have a square edge.
- C. Surface Applied Mat:
- 1. Specified product manufacturer: ADA SOLUTIONS, INC.
 - 2. Provide and install surface mount mat of homogeneous glass and carbon reinforced composite material.
 - 3. Provide Integral Uniform Color throughout product.
 - 4. Material Physical Characteristics:
 - a. Compressive Strength: greater than 28,000 psi per ASTM D 695.
 - b. Tensile Strength: greater than 11,600 psi per ASTM D 638.
 - c. Water Absorption: less than 0.07 percent per ASTM D 570.
 - d. Slip Resistance: less than 1.05 Wet/Dry per ASTM C 1028.
 - e. Flame Spread Index: less than 25 per ASTM E 84.
 - 5. Dimensions; Statistics of Truncated Domes per CBC 11B-705.1:
 - a. Base Diameter of Dome: 0.90 to 0.92 of an inch.
 - b. Top Diameter of the Dome: 0.45 to 0.47 of an inch.
 - c. Height of the Dome: 0.18 to 0.22 of an inch.
 - d. Center to Center Spacing of Domes in-line pattern: 2.3 to 2.4 inches.
 - e. All edges of panel shall have a 1/2" beveled edge.
 - 6. All traffic is prohibited until adhesive and sealant have cured.
- 2.11 CONCRETE MIXES, GENERAL
- A. Mix Design and Proportions in accordance with ACI 318 "Building Code Requirements for Structural Concrete and Commentary:"
 - B. Initial mix design shall be prepared for all concrete by recognizing testing laboratory approved by Architect. In the event that additional mix designs are required due to depletion of aggregate sources, aggregate not conforming to Specifications, or at request of Contractor, these mixes shall be prepared as above.
 - C. 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.
 - D. Mix designs with Fly Ash content greater than 15 percent of the total weight of cementitious materials shall be proportioned by ACI 318 "Building Code Requirements for Structural Concrete and Commentary."
 - 1. Provide 3 percent air entrainment typical, 6 percent for mixes with f_c greater than 4,000 psi when required.
 - E. Owner's testing laboratory shall review all mix design before submittal.
- 2.12 CONCRETE MIXES
- A. All concrete shall have the following minimum compressive strengths in accordance with ACI 318 "Building Code Requirements for Structural Concrete and Commentary" at 28 days and shall be proportioned within the following limits:
 - B. Foundations: Use for unexposed foundation concrete except as otherwise specified:
 - 1. Strength: 3,000 psi at 28 days.
 - 2. Max. Aggregate Size: 1-1/2 inch.
 - 3. Max. Water/Cement Ratio: 0.58.
 - 4. Admixture: Water Reducing.
 - 5. Weight: 145 pcf.
 - C. Building Slab On Grade: Use for interior building slab on grade, except as otherwise specified:
 - 1. Strength: 4,000 psi at 28 days.
 - 2. Max. Aggregate Size: 1 inch.
 - 3. Max. Water/Cement Ratio: 0.45.

4. Admixture: Water Reducing + Fly Ash.
5. Weight: 145 pcf.
- D. Building Slab On Grade with Shrinkage Control: Use for interior building slab on grade, except as otherwise specified:
 1. Strength: 4,000 psi at 28 days.
 2. Max. Aggregate Size: 1-1/2 inch, well graded.
 3. Max. Water Cement Ratio: 0.58.
 4. Admixture: Water Reducing + Fly Ash + Shrinkage Control.
 5. Shrinkage: 0.03% Laboratory Test, 0.035% Field Test at 28 days.
 6. Weight: 145 pcf.
- E. Structural Concrete: Use for columns, beams and walls, except as otherwise specified:
 1. Strength: 4,000 psi at 28 days.
 2. Max. Aggregate Size: 1 inch.
 3. Max. Water/Cement Ratio: 0.50.
 4. Admixture: Water Reducing.
 5. Weight: 145 pcf.
- F. Standard Weight: Use for standard weight concrete over metal deck:
 1. Strength: 3,500 psi at 28 days.
 2. Max. Aggregate Size: 3/4 inch.
 3. Cement Content: 6.0 sacks/yd min. as determined by mix design.
 4. Max. Water/Cement Ratio: 0.45.
 5. Admixture: Water Reducing + Fly Ash.
 6. Weight: 145 pcf.
- G. Standard Weight with shrinkage control: Use for standard weight concrete over metal deck:
 1. Strength: 3,500 psi at 28 days.
 2. Max. Aggregate Size: 3/4 inch.
 3. Max. Water/Cement Ratio: 0.45.
 4. Admixture: Water Reducing + Fly Ash + Shrinkage Control.
 5. Shrinkage: 0.03% Laboratory Test, 0.035% Field Test at 28 days.
 6. Weight: 145 pcf.
- H. Site: Use for exterior concrete slabs on grade such as walks, site work, mechanical and electrical pads and miscellaneous site items:
 1. Strength: 3,000 psi at 28 days.
 2. Max. Aggregate Size: 1 inch.
 3. Max. Water/Cement Ratio: 0.60.
 4. Admixture: Water Reducing.
 5. Weight: 145 pcf.
- I. Lean mix: Used for Back Fill of over excavated trenches, encasement of all penetrations, plumbing pipe, mechanical pipe under footings (plumbing & mechanical pipes and electrical conduits):
 1. Strength: 1,500 psi at 28 days.
 2. Max. Aggregate Size: 3/8 inch.
 3. Max. Water/Cement Ratio: 0.62.
 4. Admixture: None.
 5. Weight: 145 pcf.

2.13 CONCRETE MIXING

- A. Consistency of Concrete: Concrete slump, measured in accordance with ASTM C 143 "Test method for Slump of Hydraulic-Cement Concrete," shall fall within the following limits:
 1. For General concrete placement: 3 inch plus or minus 1 inch.
 - a. Polished Concrete Mix: 5" maximum.
 2. Mixes employing the specified high range water reducer shall provide a measured slump not to exceed 7 inch +/- 1 inch after dosing, 2 inch +/- 1 inch before dosing.
 - a. Polished Concrete Mix: 6" maximum if using water reducing admixture in lieu of water.

3. Concrete slump shall be taken at point of placement. Use water reducing admixtures as required, to provide a workable consistency for pump mixers. Water shall not be added in route by truck or at the jobsite without written review by the Architect.
- B. Mixing:
 1. Equipment: All concrete shall be machine mixed. Provide adequate equipment and facilities for accurate measurement and control of materials.
 2. Method of Mixing to comply with ACI 318 "Building Code Requirements for Structural Concrete and Commentary:"
 - a. Transit Mixing: Comply with ASTM C 94 "Specification for Ready-Mixed Concrete." Ready mixed concrete shall be used throughout, except as specified below.
 - 1) On-Site Mixing: Use only if method of storing material, mixing of material and type of mixing equipment is approved by Architect.
 - 2) Approval of site mixing does not relieve Contractor of any other requirements of Specifications.
 3. Mixing Time: 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.
 4. Admixtures:
 - a. Use automatic metering dispenser to introduce admixture into mix. Dispenser shall be recommended and calibrated by admixture manufacturer.
 - 1) Integrally Colored Concrete Color Pigment: Follow the manufacturers written recommendations for proper mixing of the selected pigment color.
 - b. Water Reducers may be used in concrete slabs on grade identified with a Polished Concrete Finish - coordinate with Specification Section - POLISHED CONCRETE FINISHING.
 - c. 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 percent.
 - d. 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.
 - e. All admixtures are to be approved by Architect prior to commencing this work.
 5. Re-tempering:
 - a. Concrete shall be mixed only in quantities for immediate use. Concrete, which has set shall be discarded, not re-tempered.
 - b. Indiscriminate addition of water to increase slump is prohibited.
 - c. When concrete arrives at project with slump below what is suitable for placing, water may be added only if neither maximum permissible water-cement ratio nor maximum slump is exceeded.
 - 1) Water shall be incorporated by additional mixing equal to at least half of total mixing time required.
 - 2) Any addition of water above that permitted by limitation of water-cement ratio shall be accompanied by a quantity of cement sufficient to maintain proper water-cement ratio.
 - 3) Such additions shall only be used if approved by the Architect.
 - 4) In any event, with or without addition of cement, not more than 2 gallons of water per cubic yard of concrete, over that specified in the design mix, shall be added.
 6. Cold Weather Batching: When temperature is below 40 degrees F, or is likely to fall below 40 degrees F during a 24 hour period after placing, provide adequate equipment for heating concrete materials.
 - a. No frozen materials or materials containing ice shall be used.

- b. Temperatures of separate materials, including mixing water, when placed in mixer shall not exceed 100 degrees F.
- c. When placed in forms, concrete shall have a temperature between 50 degrees F and 85 degrees F.
- 7. Hot Weather Batching: Concrete deposited in hot weather shall have a placing temperature below 85 degrees F. If necessary, ingredients shall be cooled to accomplish this.

2.14 FINISHES

A. Slab Finishes:

- 1. Tooled Finishes:
 - a. Scratch Finish: Apply scratch finish to slab surfaces to receive concrete floor topping or mortar setting beds for tile, and other bonded applied cementitious finish flooring material.
 - b. Float Finish: Apply float finish to slab surfaces to receive trowel finish and other finishes as specified; membranes, elastic waterproofing, elastic roofing, or sand-bed terrazzo.
 - c. Trowel Finish: Apply a non-slip trowel finish to surfaces to be covered with resilient flooring, thin-set ceramic or quarry tile, paint or another thin film-finish coating system
 - d. Sweat Trowel Finish: Apply a non-slip steel trowel ("sweat") finish (tight circular motion pattern approved by the Architect) to slab surfaces exposed to view.
 - 1) All exterior concrete paving and concrete finishes, at exterior concrete platforms, steps, ramps, walks, and other areas requiring non-slip finishes, unless otherwise indicated, shall have a non-slip finish (as defined by PCA - Portland Cement Association "Design and Control of Concrete Admixtures") applied in the following manner:
 - a) Medium Finish: On all surfaces having a pitch of less than 5 percent, Equivalent to a "Medium Finish" term, with at least a 1/16" reveal.
 - b) Rough Finish: On all surfaces having a pitch greater than 5 percent, Equivalent to a "Heavy Finish" term, with at least a 1/8" reveal.
 - e. Broom Finish: All concrete paving and concrete finishes, and exterior concrete platforms, steps, ramps and other areas requiring non-slip finishes, unless otherwise indicated, shall have a non-slip broom finish (as defined by PCA - Portland Cement Association "Design and Control of Concrete Mixtures") applied in the following manner:
 - 1) Medium Broom Finish.
 - a) 1/16" reveal.
 - 2) Rough Broom Finish.
 - a) 1/8" reveal.
 - f. Aggregate Finish: Apply aggregate finish to selected concrete surfaces as indicated on the drawings.
 - 1) "Cast" Aggregate Finish.
 - 2) "Washed" Aggregate Finish.
 - g. Sandblast Finish:
 - 1) "Light Sandblast Finish:" 1/16 inch reveal.
 - 2) "Medium Sandblast Finish:" 1/4 inch reveal.
 - h. Stamped Concrete Finish:
 - 1) Pattern: To be selected by Architect.
 - i. Truncated Dome Finish:
 - 1) Tactile Warning with colored hardener and sealer required to separate the pedestrian way from the vehicle way.
- 2. Applied Finishes:
 - a. Slab Curing Compound (SCC): Used as a curing compound for exterior slabs on grade with no flooring applications.

- b. Clear Floor Hardener Finish (CFH): Used to prevent "dusting," where a light degree of hardness is required to the interior slab finish.
 - c. Colored Floor Hardener Finish (COFH): Used to prevent "dusting," where a medium degree of hardness is required to the interior slab finish.
 - d. Colored Wear-Resistant Finish (COWR): Used for slab surfaces where a heavy degree of hardness is required.
 - 1) This product must have an application of colored [wax][sealer].
3. Repair finishes (Vertical surfaces):
- a. "Sack Finish:" Applied to defective surfaces mixed to the color and consistency required to match the adjacent materials in color and strength.

2.15 SOURCE QUALITY CONTROL

- A. Test, Inspection:
 - 1. Inspection of Mix:
 - a. Quality and quantity of material used shall be subject to continuous inspection by a qualified person. Sampling and testing of cement and aggregates in accordance with Title 24, Part 1, Section 4-335, and CBC Section 1705A, and Table 1705A.3.
 - b. Maintain sources of material supply constantly after approval of concrete mix.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 - 1. Contractor shall inspect bearing soil and report soft or loose unsuitable bearing soil to Architect.
 - 2. Architect will furnish Contractor with corrective measures necessary to remedy field condition.
 - 3. Do not pour concrete until suitable bearing surfaces are achieved.
 - 4. At Engineered Fill, remove soft and loose unsuitable fill and replace with concrete. Cost shall be paid by Contractor.
 - 5. Contractor shall inspect and identify any site conditions and/or design information that prevents the Contractor from complying with the laws, regulations and/or building codes governing ADA access compliance.

3.2 PREPARATION

- A. Transportation of Concrete:
 - 1. Handle Concrete from mixer to place of final deposit as rapidly as practical by methods which shall prevent the separation or loss of the ingredients in accordance with ACI 304.3R "Heavyweight Concrete Measuring, Mixing, Transporting, and Placing."
 - 2. Do not move concrete horizontally by means of vibrators.
 - 3. Deposit concrete as nearly as practical at its final position in a manner which, will ensure that required quality is obtained.
 - 4. Chutes shall slope not less than 4 inches and not more than 6 inches per foot of horizontal run.
- B. Protection:
 - 1. At old concrete or concrete which has begun to set upon which Concrete is to be placed:
 - a. Surface shall be level, cleaned of all laitance and rough with solidly embedded large aggregate exposed.
 - b. Rough surface by chipping entire surface not earlier than 5 days after set, by high pressure hosing (80 pounds per square inch) 2 to 4 hours after placing or by sand blasting with coarse silica sand, roughness amplitude shall be at least 1/4 inch.
 - c. Not more than 1/2 hour prior to pouring concrete, place 2 inch thick uniform layer of grout on old concrete.
- C. Surface preparation:
 - 1. Prepare base materials prior to forming footings and trenches.

2. Remove all water from excavation. Divert flow of water through drains using methods to avoid washing over freshly deposited concrete.
3. Remove hardened concrete, wood chips, shavings and other debris from interior of forms and from reinforcing steel by vacuum process.
 - a. No wooden ties or blocking shall be left in concrete except where indicated for attachment of other work.
4. Forms shall have been erected, adequately braced, cleaned, sealed, lubricated if required, and bulkheaded where placing is to stop.
5. 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.
6. Reinforcing steel shall have been placed, tied and supported.
7. Coordinate with Specification Section - SOIL TREATMENT before placing any concrete.
8. Embedded work of all trades shall be in place in the forms and adequately tied and braced.
9. Reinforcing steel, at the time the concrete is placed around it, shall be cleaned of scale, mill scale or other contaminants that will destroy or reduce bond.
10. Concrete surfaces to which fresh concrete is to be bonded shall be brush cleaned to remove all dust and foreign matter and to expose the aggregate, and then coated with the bonding adhesive herein specified.
11. Prior to placing concrete for any slabs on grade, the moisture content of the subgrade below the slabs shall be adjusted to at least optimum moisture.
12. No concrete shall be placed until formwork, reinforcement, and embedded items have been approved by the Architect.
 - a. Clean forms of all debris and remove standing water.
 - b. Thoroughly clean reinforcement and all handling equipment for mixing and transporting concrete.
 - c. Concrete shall not be placed against reinforcing steel that is hot to the touch.
13. Provide runways or other approved means for wheeled equipment. Do not wheel equipment over reinforcing or formwork.

3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF BASE

- A. Placing of Rock Base:
 1. Shall occur after scarification and compaction operations.
 2. Preparation of sub-grade and selection and placing of Rock Base subject to continuous inspection and supervision of Geotechnical Engineer.
 3. Compact Rock Base to a density of not less than ninety-two (92) percent, but not more than ninety-five (95) percent, in accordance with Test Designation ASTM D 1557 "Test methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lb./sq.ft.)."

- a. Density of each layer of Rock Base shall be tested and verified that it meets required density of Geotechnical Engineer prior to placing any other succeeding layers.
 4. Roll Rock Base under interior (and any designated exterior slabs) to smooth surface, free of large or sharp particles.
 5. Conduct work to minimize inspection costs.
 6. Costs of initial compaction tests shall be borne by the Owner. Contractor shall pay for all re-tests required due to failure of initial tests.
- B. Placing of Sand Base:
1. Shall occur after scarification and compaction operations.
 2. Preparation of any sub-grade Engineered Fill, placing of Vapor Retarder, and placing of Sand Base subject to continuous inspection and supervision of Geotechnical Engineer.
 3. Compact Sand Base to a density of not less than ninety-two (92) percent, but not more than ninety-five (95) percent, in accordance with Test Designation ASTM D 1557 "Test method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/sq.ft.)."
 - a. Density of each layer of Sand Base shall be tested and verified that it meets required density of Geotechnical Engineer prior to placing any succeeding layers.
 4. Roll Sand Base under interior (and any designated exterior slabs) to smooth surface, free of large or sharp particles.
 5. Conduct work to minimize inspection costs.
 6. Costs of initial compaction tests shall be borne by the Owner. Contractor shall pay for all re-tests required due to failure of initial tests.

3.5 INSTALLATION OF VAPOR RETARDER

- A. General:
1. Follow ASTM E 1643 "Standard Practice and Procedure for Installation of Vapor Retarder used in Contact with Earth Fill Under Concrete Slabs."
 2. Level, tamp or roll Earth Fill or Base Material beneath the slab in thickness as indicated on the drawings. Remove all sharp objects that could puncture the Vapor Retarder.
 3. Unroll Vapor Retarder over the area where the slab is to be poured, with the longest direction parallel with the direction of the pour.
 4. Cut to size, if necessary. Vapor Retarder used shall completely cover the pour area.
 5. All joints/seams, both lateral and butt, shall be overlapped six (6) inches and taped using a compatible four (4) inch wide Pressure Sensitive Seaming Tape.
 - a. Tape areas shall be free from dust, dirt and moisture to allow maximum adhesion of the pressure sensitive tape.
 - b. Vapor Retarder shall overlap six (6) inches and seal to top of all footings and against vertical walls. Provide manufacturer's written recommended sealant.
 6. Repair any damaged areas in accordance with manufacturer's written recommendations, and overlap repairs a minimum of six (6) inches in all directions with Vapor Retarder Material, Pressure Sensitive Tape, and Vapor Proofing Mastic.
 7. Follow manufacturer's written recommendations for vertical wall applications.
- B. Penetrations:
1. Seal all penetrations and check that all pipe, ductwork, rebar, wire penetrations and block-outs are thoroughly sealed.
 2. Single Pipe Penetrations may be sealed using pipe boot constructed from the product.
 - a. Cut a piece of plastic, width - 12 inches, length - 1 and 1/2 times the circumference of the pipe with scissors; cut slits half the width of the film, and wrap the boot around the pipe; tape onto pipe and completely tape the base to the Vapor Retarder.
 3. Multiple pipe penetrations in close proximity and very small pipes may be sealed using Vapor Proofing Mastic.
 - a. Cut out small area around pipes; cut a patch of Vapor Retarder extending at least 6 inches past the cut out in all directions; cut X's or small circles in the patch and

install over pipes; overlap at least 6 inches and tape; build up 40-60 mils of mastic, or as needed to completely fill all voids between the pipe and Vapor Retarder.

4. No penetration of the Vapor Retarder is allowed except for reinforcing steel and permanent utilities.
 - a. In the case that forms must be used vapor stakes should be used to hold forms in place.
 - b. Penetrate plastic with stake; treat stake as pipe penetration (see above "penetration" paragraphs; leave stake permanently in concrete; using a power saw, cut stake off above the seal, but below the concrete finished surface; the lower portion of the vapor stake remains in place, permanently plugging the penetration.

3.6 JOINTS

- A. General: Construct joints straight, horizontal, true with faces perpendicular to surface plane of concrete and free of "overhangs" or "lips" to line.
- B. Construction Joints:
 1. Location: as indicated or as approved by Architect.
 2. Install as to least impair strength of structure, appearance of concrete and shall conform to typical details and in accordance with ACI Standards.
 3. Joints between concrete and masonry shall be considered construction joints.
 4. Spacing: Pour lengths shall be as follows, unless specifically noted otherwise.

a. Foundations:	100 feet maximum
b. Walls:	60 feet maximum
c. Structural Slabs:	60 feet o.c. maximum
d. Interior Slabs on grade:	30 feet o.c. maximum
e. Exterior Slabs on grade:	30 feet o.c. maximum
 5. Installation:
 - a. Construction joints shall have level tops, vertical sides.
 - b. Construction joints shall be thoroughly cleaned and roughened by removing entire surface film and exposing clean aggregate solidly embedded in mortar matrix.
 - c. See drawings for doweling and required keys.
 - d. Roughen construction joints by any of the following methods:
 - 1) By sandblasting joint.
 - 2) By thoroughly washing joint, using a high pressure hose, after concrete has taken initial set. Washing shall be done not less than 2 hours nor more than 4 hours after concrete has been poured, depending upon setting time.
 - 3) By chipping and wire brushing.
 - 4) Vertical construction joints need not be roughened
 - e. All decisions pertaining to adequacy of construction joint surfaces and to compliance with requirements pertaining to construction joints shall be reviewed with the Architect.
 - f. Just before starting new pour, horizontal and vertical joint surfaces shall be dampened (but not saturated).
 - g. Before placing regular concrete mix, horizontal and vertical joint surfaces shall be covered with a layer of mortar composed of cement and fine aggregate of same proportions as that used in prescribed mix, but omitting coarse aggregate.
- C. Expansion Joints:
 1. Location: as indicated or as approved by Architect.
 - a. Exterior slabs on grade: locate at walks, curbs, gutters, etc.
 - 1) Locate at each side of structure/vertical surface, curb transition opposite apron joints, end of curb returns, and back of curb when adjacent to walk.
 - b. Interior slabs on grade: Install at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 2. Spacing:
 - a. Exterior Slabs on grade: 30 feet o.c. maximum, unless otherwise noted.
 - b. Interior Slabs on grade: as indicated.

3. Installation:
 - a. Install Expansion Filler in expansion joints.
 - 1) Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless noted otherwise.
 - 2) Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface.
 - 3) Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
 - 4) "Glue" Expansion Filler to edge of previous pour.
 - b. When concrete has taken initial set, the edge of concrete surface shall be rounded by tooling to top of Expansion Filler.
 - c. Interrupt reinforcing at all expansion joints.
- D. Control Joints (Contraction Joints):
 1. Location: as indicated or as approved by Architect.
 - a. Construction and expansion joints shall be considered as control joints.
 2. Spacing:
 - a. Exterior Slab on grade: 10 feet o.c. maximum, unless otherwise noted.
 - b. Interior Slab on grade: 15 feet o.c. maximum.
 - 1) Maximum area not to exceed 225 sf.
 - 2) Maximum length to width not to exceed 1 to 1 1/2 ratio.
 - 3) Conform to bay spacing wherever possible (at column centerlines, half bays, third bays, etc).
 3. Installation: Form weakened-plane control joints, sectioning concrete into areas as indicated.
 - a. Use saw cuts 1/8 inch wide by 1/4 of slab depth, or tooled joints with rounded edges 1/8 inch wide by 1/4 of slab depth, unless specifically noted otherwise.
 - b. Control joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing without dislodging aggregate and with no spalling of edges on either side of the joint.
 - c. Slab reinforcing need not be terminated at control joints.

3.7 CONCRETE PLACEMENT

A. Placing of Concrete - General:

1. All concrete shall be placed under direct observation of the Owner's Inspector.
2. Notify Owner's Inspector not less than forty-eight (48) hours prior to pouring of first concrete.
3. Place concrete in accordance with ACI 304.3R "Heavyweight Concrete Measuring, Mixing, Transporting, and Placing."
4. Do not place Concrete outside of regular working hours except to complete work already started.
5. Do not use Concrete which has been mixed for a period longer than one and one-half (1-1/2) hours or which has started to stiffen or set.
6. Re-mixing on concrete, which has started to set, shall not be permitted.
7. Pouring of concrete shall be a continuous operation until the completion of the Section or Panel in accordance with ACI 304.3R "Heavyweight Concrete Measuring, Mixing, Transporting, and Placing."
8. Consolidation:
 - a. Concrete shall be thoroughly compacted and worked to all points with solid continuous contact to forms and reinforcement to eliminate air pockets and honeycombing.
 - b. Power vibrators shall be used immediately following pour.
 - c. Spading by hand, hammering of forms or other combination of methods will be allowed only where permitted by Architect.
 - d. In no case shall vibrators be placed against reinforcing steel or used for extensive shifting of deposited fresh concrete.

- e. Provide and maintain standby vibrators, ready for immediate use.
 - 9. Keep a record of times, dates and locations of all concrete placing operations for the duration of the project. Record shall be available to Architect and Owner's Inspector at all times.
 - 10. In no case shall concrete be poured into an accumulation of water ahead of pour.
 - 11. If any concrete operation, once planned, can not be completed in a continuous operation, placement shall stop at temporary bulkheads located where resulting construction joints will least impair the strength of the structure. The location of construction joints shall be as shown on the drawings, or as approved by Architect.
 - 12. Hot Weather Concreting: Unless otherwise directed by the Architect, perform all work in accordance with ACI 305.1 "Specification for Hot Weather Concreting" when air temperature rises above 75 degrees 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 85 degrees F.
 - 1) The method employed to provide this temperature shall in no way alter or endanger the design mix or the design strength required.
 - 2) Dampen subgrade and formwork before placing concrete.
 - 3) Remove all excess water before placing concrete.
 - 4) Keep concrete continuously wet when air temperature exceeds 85 degrees F for a minimum of 48 hours after placing concrete.
 - d. Protection: Minimize evaporation from concrete in place by providing shade and windbreaks. Maintain such protection for 14 days minimum.
 - 13. Cold Weather Concreting: Follow recommended ACI 306R "Cold Weather Concreting" procedures when air temperature falls below 40 degrees F, as approved by Architect.
 - a. Concrete placed in freezing temperature shall have a temperature of not less than 50 degrees F.
 - b. Maintain this temperature for at least 7 days.
 - c. No chemicals or salts shall be used to prevent freezing and no accelerating agents shall be used without prior approval from Architect.
 - 14. Concrete shall not be placed if sand overlying the vapor retarder barrier has been allowed to attain a moisture content greater than 5 percent due to precipitation or excessive watering.
- B. Placing of Concrete at Footings, Walls, Columns, etc.:
- 1. Concrete shall be placed in layers not to exceed twenty-four (24) inches in depth, and shall be thoroughly compacted.
 - a. Wait forty minutes before placing next layer.
 - b. Re-vibrate six (6) inches into previous lift before next lift is added.
 - c. Locate top of lift at or below top of wall opening.
 - 2. Use openings in forms, elephant trunks or other approved methods to prevent accumulation of concrete on forms and reinforcement above the level of pour.
 - a. Unconfined free falls shall not exceed five (5) feet.
 - 3. Where placing or consolidation is restricted by close assemblage of reinforcing and/or forms use a Modified Mix Concrete with smaller aggregate and/or pour 3 inches of neat grout into form prior to regular mix.
 - 4. Concrete shall not be flowed horizontally along forms.
- C. Placing of concrete at slab on grade:
- 1. Slabs on grade shall not be poured until the sub-grade has been thoroughly compacted and properly prepared, complete with vapor retarder or barrier, nor until reinforcement and inserts are securely fastened in place.

- a. Sub-grade above and below vapor retarder where installed resilient flooring products or rubber/vinyl-backed products are proposed to be installed shall not be moistened prior to pouring concrete.
 2. No greater area shall be poured at one time than can be properly finished without checking.
 3. Slabs on grade shall be laid out in a checkerboard pattern when applicable. Pour and allow alternate slabs to set.
 - a. Fill out balance of checkerboard pattern with subsequent pour.
 4. Concrete shall be poured as dry as possible, consistent with good workmanship.
 - a. Water shall not be added to mix to improve workability without approval of the Architect.
 5. Concrete shall be compacted by hand tamping and by mechanical vibration.
 - a. After the concrete is thoroughly compacted, the surface shall be screeded off, any surface water removed and finish applied as specified.
 6. The Contractor may, on approval of DSA and the Architect, use a Finish Enhancing Admixture (High Range Water Reducer) in accordance with Article Titled MATERIALS.
- D. Placing of concrete over Metal Decks:
1. Provide a work plan detailing the means and methods to be used for placement of concrete, including screeding procedures and locations of any construction joints, which will achieve the performance criteria noted below.
 - a. A pre-construction meeting shall be scheduled by the General Contractor, to include the concrete sub-contractor, Polished Concrete sub-contractor, Architect, Structural Engineer, and Owner's Representative to discuss the work plan and performance objectives.
 2. Deposit concrete near columns then screed away from columns over beams, then to the areas of higher deflection.
 3. The final top of concrete elevation shall not deviate be more than 3/8" above or below the top of concrete elevation noted on the plan.
 4. Concrete over Metal Deck shall be screeded flat between screed rails to obtain a maximum deviation of 1/4" over 10'-0" measured using a straight edge.
 - a. Measurements shall be taken uniformly across the floor area.
 - b. Areas of non-compliance shall be reviewed by the Owner and Architect and may require additional floor leveling.
 5. In no case shall the depth of concrete over metal deck be less than that specified on the plan.
 - a. Note that the concrete depth will vary due to deck and beam deflections during concrete placement, and shall be considered in the estimating of concrete volume, cost and placement strategies.
- E. Placing of concrete on above grade slabs:
1. General: In addition to all the preceding requirements for pouring concrete, on above grade slabs the contractor shall coordinate the pour so as to not over stress the structure and evenly distribute the pours to minimize deflection for the structural members in order to minimize slab cracking.
- F. Placing of concrete by pumps:
1. If pumps are used to place concrete, the fines (3/8" and smaller) shall not exceed 45 percent of the total volume of aggregate. Standby equipment must be provided to insure completing pours to planned cutoffs.
 2. Pumps shall handle concrete at a uniform rate without bleeding or segregation of aggregates. Concrete from end of the hose shall have a free fall not to exceed four (4) feet. Aluminum pipe shall not be used to transport pumped concrete.

3.8 INSTALLATION OF SHRINKAGE-RESISTANT GROUT

- A. Installation of nonshrink grout or drypack: Install under base plates immediately after erection of structural steel.

1. General: Ram in thin layers, using a short length of ram, the free end of which shall be struck with a heavy hammer or mallet, several blows for each layer, to compact the mixture. When completed, the exposed drypack shall show slight indication of moisture.
2. Curing: Cure with a curing compound or with moisture-retaining barrier kept wet.

3.9 APPLICATION

A. Finishes application:

1. Screed, consolidate, and level concrete slabs prior to any Finishes.
2. Tooled Finishes:
 - a. Scratch finish:
 - 1) After screeding, consolidating, and leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
 - b. Float finish:
 - 1) After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating.
 - 2) Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both.
 - 3) Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power units.
 - 4) Finish surfaces to tolerances indicated.
 - 5) Cut down high spots and fill low spots.
 - 6) Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
 - c. Trowel finish:
 - 1) After floating, begin first trowel-finish operation using a power-driven trowel.
 - a) Begin final troweling when surface produces a ringing sound as trowel is moved over surface.
 - b) Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances indicated.
 - c) Grind smooth any surface defects that would telegraph through applied floor covering system.
 - 2) Where thin set ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.
 - 3) Apply a non-slip "Sweat Trowel" finish (tight circular motion approved by the Architect) to exterior slabs in the final troweling operation.
 - d. Broom finish:
 - 1) Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route for the indicated broom finish.
 - 2) Medium Broom Finish: On all surfaces having a pitch of less than 6 percent.
 - 3) Rough Broom Finish: On all surfaces having a pitch of more than 6 percent.
 - e. Aggregate Finishes:
 - 1) "Cast" Aggregate Finish method:
 - a) After completing float finishing and before starting trowel finish, uniformly spread 25 lb. of dampened aggregate per 100 sq. ft. of surface.
 - b) Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
 - c) After broadcasting and tamping, apply trowel finishing as specified.

- d) After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose aggregate.
- e) Quality of finish shall be in accordance with approved mock-up.
- 2) "Washed" Aggregate Finish method:
 - a) When concrete has cured sufficiently to hold aggregate, but soft enough to remove surface cement, wash and brush surface to expose aggregate.
 - b) Quality of finish shall be in accordance with approved mock-up.
- 3. Sandblast Finishes:
 - a. "Light Sandblast Finish" by the Abrasive Blast Method:
 - 1) Miscellaneous concrete structures as indicated on the drawings.
 - 2) Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi. Coordinate with formwork removal to ensure that surfaces to be abrasive blasted are treated at same age for uniform results.
 - 3) Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
 - 4) Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
 - 5) Sufficient to expose fine aggregate with occasional exposure of coarse aggregate as follows:
 - a) Maximum Reveal: 1/16 inch.
 - b) Cracks, voids, protrusions, spalls, or non-uniform color or texture will not be acceptable.
 - b. "Medium Sandblast Finish" by the Abrasive Blast Method:
 - 1) Miscellaneous concrete structures as indicated on the drawings.
 - 2) Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi. Coordinate with formwork removal to ensure that surfaces to be abrasive blasted are treated at same age for uniform results.
 - 3) Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
 - 4) Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
 - 5) Sufficient to expose fine aggregate with occasional exposure of coarse aggregate as follows:
 - a) Maximum Reveal: 1/4 inch.
 - b) Cracks, voids, protrusions, spalls, or non-uniform color or texture will not be acceptable.
- 4. Stamped Concrete:
 - a. Stamp overlay surfaces according to manufacturer's instructions. Plan stamp layout prior to application of stamps
 - b. Liquid Release Agent Application: Apply a liberal coat of liquid release agent to cementitious stampable overlay when set sufficiently to achieve a clean impression
 - c. Stamping
 - 1) Stamp perimeter of pour, using texture skins.
 - 2) Accurately align stamp mats in sequence and tamp into cementitious stampable overlay to produce imprint pattern, texture, and depth of imprint,

according to manufacturer's instructions. Remove stamps from cementitious stampable overlay immediately.

- 3) Stamp edges and surfaces unable to be imprinted with stamp mat with texture skins.
 - 4) Use stamp tools to imprint grout lines at edges and surfaces unable to be imprinted with stamp mats.
5. Truncated Dome Finishes:
- a. Cast-In-Place Replaceable Truncated Domes Mat:
 - 1) Installation: Install into freshly poured concrete per manufacturer's instructions.
 - a) Tamp and vibrate into freshly poured concrete to ensure that there are no voids or air pockets.
 - b) Field level flush to the adjacent concrete surfaces to permit proper water drainage and eliminate tripping hazards.
 - 2) Cut and set into size and configuration as indicated.
 - a) Minimize any cantilever effect when cutting between successive embedment ribs.
 - b) Top of the body shall be fully seated and flush with adjacent concrete substrate.
 - 3) Orient domes such that the rows of inline truncated domes are parallel with the direction of the ramp.
 - a) When multiple mats are used, the truncated domes shall be aligned between the tactile warning surfaces and throughout the entire tactile warning surface installation.
 - 4) Do not create voids between the underside of the tile and the concrete.
 - a) No walking, leaning or external forces shall be placed during and after installation and the concrete curing stage.
 - 5) Remove protective plastic sheeting within twenty four (24) hours of installation.
 - 6) Clean mat by method specified by manufacturer.
 - 7) If requested, clean mats not more than four (4) days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project.
 - 8) All traffic is prohibited until adhesive and sealant have cured.
 - b. Surface Applied Truncated Domes Mat:
 - 1) Installation:
 - a) Mechanically fasten and adhere panels to existing concrete substrate.
 - b) Fasteners shall be countersunk Stainless Steel with Powder Coated head to match mat color.
 - c) Minimum 1-1/2" penetration into existing concrete substrate.
 - d) Minimum 12 fasteners per panel.
 - e) Provide continuous urethane adhesive around perimeter and across the center of mat prior to mechanically attaching.
 - f) Provide continuous seal at outside perimeter of mat per manufacturers recommendations.
 - g) Clean excess adhesive and sealant.
 - h) All traffic is prohibited until adhesive and sealant have cured.
6. Applied Finishes:
- a. Slab Curing Compound Finish (SCC):
 - 1) Apply Clear Slab Curing Compound Sealer Finish in accordance with manufacturer's written recommendations, and in exterior areas only as indicated by the Contract Documents.
 - b. Clear Floor Sealer Finish (CFS):
 - 1) Apply Clear Floor Sealer Finish in accordance with manufacturer's written recommendations, and in areas as indicated by the Contract Documents.

- c. Clear Floor Hardener Finish (CFH):
 - 1) Apply Clear Floor Hardener Finish in accordance with manufacturer's written recommendations, and in areas as indicated by the Contract Documents.
 - d. Colored Floor Hardener Finish (COFH):
 - 1) Apply Colored Floor Hardener Finish in accordance with manufacturer's written recommendations, and in areas as indicated by the Contract Documents.
 - e. Colored Wear-Resistant Finish (COWR):
 - 1) Apply dry shake materials for the colored wear-resistant finish at a minimum rate of 100 lb per 100 sq. ft.
 - 2) Immediately following the first floating operation, uniformly distribute with mechanical spreader approximately two-thirds of the required weight of the dry shake material over the concrete surface, and embed by power floating.
 - a) Follow floating operation with second shake application, uniformly distributing remainder of dry shake material with overlapping applications to ensure uniform color, and embed by power floating.
 - 3) After broadcasting and floating, apply a trowel finish as specified.
 - a) Cure slab surface with a curing compound recommended by the dry shake material manufacturer.
 - b) Apply the curing compound sealer immediately after the final finishing.
7. Repair Finishes:
- a. Sack Finish: Use only enough water as required for handling and placing.
 - 1) Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than one (1) inch.
 - a) Make edges of cuts perpendicular to the concrete surface.
 - b) Thoroughly clean, dampen with water, and brush-coat the area to be patched with a bonding agent.
 - c) Place patching mortar before bonding agent has dried.
 - 2) For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color.
 - a) Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b) Compact mortar in place and strike-off slightly higher than surrounding surface.
- B. Concrete curing and protection:
- 1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - a. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material.
 - b. Apply according to manufacturer's written instructions after screeding and bull floating, but before power floating and troweling.
 - 2. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than ten (10) days.
 - 3. Formed Surfaces:
 - a. Wet forms immediately after pouring.
 - b. Keep forms and exposed surfaces wet until forms are removed.
 - c. Keep all surfaces wet after forms are removed for ten (10) days after placement of Concrete.
 - 4. Concrete Slab Curing Methods:
 - a. One spray coat of clear curing compound.

- 1) Agitate curing compounds thoroughly by Mechanical means continuously during use and spray or brush uniformly in accordance with manufacturer's written recommendations.
- 2) Not applicable for:
 - a) Slabs designated for Adhesively Applied Floor Coverings.
 - b) Slabs designated for Resinous Flooring on top of concrete slab.
 - c) Slabs designated for Polished Concrete Finishing.
- b. Curing paper:
 - 1) Anchor the paper or film securely and seal all edges in such a manner as to prevent moisture escaping from concrete.
 - 2) Protect all exposed surfaces with "Curing Paper." Curing Paper shall be kept moist.
 - 3) Contractor shall be responsible for protection of finished concrete against injury by rain, cold, vibration, animal tracks, marking by visitors, vandalism, etc.
 - 4) Required for the following:
 - a) All interior concrete slabs.

3.10 CONSTRUCTION TOLERANCE

A. Exterior Site Improvements:

1. Placement of all concrete shall not exceed 0.02 feet variance from designated grades.
2. Surface variation of all concrete slabs shall not exceed 0.01 foot in 10 feet.
3. Construction of all concrete subject to ADA access compliance, including Accessible Path of Travel, curb returns, parking stalls and unloading areas, barrier free amenities and / or other applicable site improvements shall conform to the Americans with Disabilities Act, California Title 24 and the California Building Code, regardless of any construction tolerances. Examples of minimum and maximum limits related to ADA access compliance include, but are not limited to:
 - a. Accessible Path of Travel cross-slope shall not exceed 2 percent.
 - b. Accessible Path of Travel longitudinal slopes shall not exceed 5 percent.
 - c. Ramp longitudinal slopes shall not exceed 8.33 percent.
 - d. Walks shall not have less than 48 inches in unobstructed width.
 Maintain all grades and slopes throughout construction and until Notice of Completion has been filed.

B. Building Slabs:

1. General: All surface variations of slabs shall be less than 1/8 inch in 10 feet. Uniformly slope slab surfaces to drains where indicated on the drawings.
2. Typical Building Slabs:
 - a. Flatness: SOV, greater than FF 35, MLV, greater than FF 24.
 - b. Levelness: SOV, greater than FL 25, MLV, greater than FL 17.
3. Polished Concrete Flooring Slabs:
 - a. Flatness: SOV,; greater than FF 45, MLV,; greater than FF 30.
 - b. Levelness: SOV,; greater than FL 35, MLV,; greater than FL 24.
4. FF (Floor Flatness) and FL (Floor Levelness): The Contractor shall measure according to ASTM E 1155 "Standard test method for Determining FF (Floor Flatness) and FL (Floor Levelness) Numbers," within twenty-four (24) hours of the pour.
 - a. Cut down high spots, and fill low spots, and adjust pour techniques to achieve floor tolerances specified.
 - b. Contractor shall pay for and have a Certified Report in writing from an Independent Testing Agency that concrete substrates requiring FF and FL only are constructed to the specified tolerances, and are ready for floor coverings that require FF and FL.
 - c. SOV = Specified Overall Value.
 - d. MLV = Minimum Local Value.

- e. Tolerances are required by the Polished Concrete Finishing Industry as an adequate substrate for their mechanized polishing machines to achieve any desired sheens on concrete surfaces.
- f. Required tolerances of concrete surface substrates for specific flooring systems:
- g. Polished Concrete: Refer to Specification Section - POLISHED CONCRETE FINISHING.

3.11 REPAIR / RESTORATION

A. Minor Defects:

- 1. Minor defects in concrete shall mean any of the following:
 - a. Pour joints, voids, rock pockets, tie holes, etc. where strength, and durability is not adversely affected.
 - b. Shrinkage Cracks where slabs are not exposed or where appearance is not important
 - c. Minor defects of pour joints, voids, rock pockets, tie holes, etc.
 - d. Immediately after removing forms, inspect all concrete surfaces. Patch any pour joints, voids, rock pockets, tie holes, etc., as soon as possible, but not until the defect has been examined by the Architect.
 - e. Chip away defective areas to a minimum depth of one inch, with edges perpendicular to surface. Clean area to be patched of all laitance.
 - f. Coat area to be patched with Bonding Agent. Patch with Mortar mixed with Bonding Agent thoroughly compacted into place and screeded off to leave the patch slightly higher than the surrounding surface. After at least one hour finish patch to match the adjoining surface. Cure patch by application of curing compound or by wetting for seven (7) days.
 - g. Fill tie holes solid with mortar after cleaning and thoroughly wetting. Fill through holes by means of a plunger-type grease gun. See Specification Section - CONCRETE FORMWORK, Part 3 Article titled "INSTALLATION," and the paragraph titled "Indentations" for exception.
 - h. Remove fins and rough surfaces from all exposed concrete.
- 2. Minor defect of shrinkage cracks:
 - a. After entire slab is finished and fully cured, shrinkage cracks larger than 1/32 inch wide shall be filled with cement grout and struck off level with surface.

B. Serious Defects:

- 1. Serious defects in concrete shall mean any of the following:
 - a. Concrete not meeting 100 percent of the specified 28 day compressive strength.
 - b. Concrete exhibiting rock pockets, voids, spalls, streaks, cracks, exposed reinforcing to extent that strength, durability, or appearance is adversely affected.
 - c. Concrete significantly out of place, line or level.
 - d. Concrete not containing the required embedded items.
 - e. Shrinkage Cracks where slabs are exposed and appearance is important.
 - f. Concrete where patching does not satisfactorily restore quality and appearance of surface.
- 2. Upon determination that concrete strength is defective:
 - a. 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.
 - b. Cores of hardened concrete shall be taken and tested in accordance with ASTM C 39 "Test method for Compressive Strength of Cylindrical Concrete Specimens" and ASTM C 42 "Test method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete." Number and location of such cores shall be subject to the approval of Architect.
 - c. Cost of core sampling and testing will be paid for by the Contractor.

- d. "500 psi" and "85 percent" reduction in ACI 318 "Building Code requirements for Structural Concrete and Commentary," Section 26.12.4 will not justify low cylinder tests.
- e. If core tests indicate that concrete is below the strength specified, the concrete shall be deemed defective, and shall be removed and replaced without additional cost to the Owner.
- 3. Major defect of shrinkage cracks.
 - a. After entire slab is finished and fully cured, unsightly shrinkage cracks shall be repaired in a manner satisfactory in appearance to the Architect. If this cannot be accomplished, concrete shall be considered defective.
- 4. Upon determining that concrete surface is defective:
 - a. Contractor may restore concrete to acceptable condition by cutting, chipping, pointing, patching, grinding, if this can be done without significantly altering strength of structure.
 - b. 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.
 - c. 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.
 - d. No repair work shall begin until concrete has been examined and procedures have been reviewed by the Architect and Structural Engineer and approved by [DSA][HCAI][AHJ].
- 5. Repair defects by complete removal of concrete and replacement or repair defects with Shotcrete in accordance with CBC Sections 1908A, strength to match mix design and material being repaired.
- 6. Place and cure Shotcrete in accordance with CBC Section 1908A.
- 7. Inspect and test Shotcrete as per CBC Section 1908A.2.
- C. Cost of repairing shall be borne by the Contractor.

3.12 FIELD QUALITY CONTROL

A. Contractor's Field Quality Control:

- 1. Contractor shall protect slabs receiving flooring products from excess moisture after the curing process, removing excess moisture after rains, broken water pipes, etc., to ensure that the monolithic slabs are dry enough for application of flooring products. When all spaces have been enclosed, acclimate the building as soon as possible with the building's own mechanical heating and cooling system, and other outside devices as required to properly prepare the monolithic slabs for flooring installation.
 - a. The test sites for the RH Tests shall be at the same room temperature and humidity expected during normal use. If this is not possible, then the test site conditions should be 75 degrees F (plus or minus 10 degrees F) and 50 percent relative humidity (plus or minus 10 percent relative humidity) 48 hours prior to, and during testing.
- 2. Contractor shall maintain temperature and humidity in a manner not deleterious to the flooring materials installed until the Owner assumes occupancy.

B. Site Tests:

1. Compression Tests:

- a. Testing Agent will make a set of four (4) concrete compression cylinders from each fifty (50) cubic yards or every 2,000 sq.ft. of surface area for slabs and walls per CBC Section 1905A.1.17 of each class of concrete, or fraction thereof, placed each day, and cure and test concrete compression cylinders in accordance with ASTM C 31 "Practice for Making and Curing Concrete Test Specimens in the Field," ASTM C 39 "Test method for Compressive Strength of Cylindrical Concrete Specimens," ACI Section 26.12 and ASTM C 172 "Practice for Sampling Freshly Mixed Concrete."

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- 1) From each concrete compression cylinder set, Testing Agent shall test one cylinder at age seven (7) days, test two cylinders at age twenty-eight (28) days per ACI 318 "Building Code requirements for Structural Concrete and Commentary," Section, 26.12 and hold one cylinder for test only if directed by the Architect.
 - 2) Cylinders shall be identified as to area from which they were taken and show the date and time of day they were prepared.
 - b. Testing Agent shall also test Grout and Mortar as required for compliance to Compression Requirements specified.
 2. Drying Shrinkage Test (Lightweight Concrete Slabs only):
 - a. Testing agent will make three identical 4" x 4" x 11" specimens from the same concrete as used in the structure for the purposes of measuring Drying Shrinkage.
 - 1) Record time and location of concrete from which specimens were taken.
 - 2) Percent of shrinkage shall be reported at 21 days after 7 day moist curing period.
 - 3) Average results of 3 specimens shall be used as the accepted value.
 - 4) The value for laboratory cast specimens shall not exceed .040 percent.
 - 5) If field test specimens are used in lieu of laboratory specimens, a tolerance of +33 percent may be used.
 - C. Inspection:
 1. Project Inspector shall inspect placement of concrete and grout.
 - D. Manufacturer's Field Services:
 1. Contractor shall notify Vapor Retarder manufacturer at least one week prior to the Pre-Construction Conference regarding the Vapor Retarder installation, and will schedule subsequent visits at the appropriate times with at least one week's notice to ensure proper installation of the Vapor Retarder in accordance with the Manufacturer's Written Instructions.
 2. Manufacturer shall provide and written Inspection and installation certification to the Architect that full compliance with the manufacturer's written instructions were followed and adhered to prior to covering with concrete.
- 3.13 CLEANING
- A. The top of all concrete foundations receiving concrete masonry units shall be washed free of all laitance and loose concrete, and roughened to a roughness amplitude of 1/4".
 - B. Remove all debris, excess materials, tools, and equipment resulting from or used in this operation at completion of work.

END OF SECTION

SECTION 03 35 10 – POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely provide polished concrete finishing materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 11 01 CONCRETE FORMWORK
 - 4. 03 30 00 CAST-IN-PLACE CONCRETE
 - 5. 07 92 00 SEALANTS
 - 6. 09 65 10 RESILIENT BASE AND ACCESSORIES
 - 7. 09 68 40 CARPET
 - 8. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. ACI American Concrete Institute.
 - 1) ACI 302.1R "Guide for Concrete Floor and Slab Construction."
 - b. ASTM American Society of Testing Materials.
 - c. NFSI National Floor Safety Institute.
 - 1) NFSI Test Method 101-A "Standard for Evaluating High-Traction Flooring Materials, Coatings, and Finishes."
 - d. RILEM Reunion Internationale des Laboratoires D'Essais et de Recherches sur les Matériaux et les Constructions.
 - 1) RILEM Test Method 11.4 "Standard Measurement of Reduction of Moisture Penetration Through Horizontal Concrete Surfaces."

1.3 DEFINITIONS

- A. New Concrete: Concrete poured as part of this Project. Refer to Specification Section - CAST-IN-PLACE CONCRETE.
- B. Existing Concrete: Any slab existing (or poured) prior to this Project.

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements: It is the intention of this section and the drawings to form a guide for a complete system. Any items not specifically noted but necessary for a complete system shall be provided under this section.
 - 1. Fire Rating: Class "A" Fire Rated when tested in accordance with ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials."
 - 2. Abrasion Resistance:

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- a. ASTM C 779 "Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces," Method A, high resistance, no more than 0.008 inch (0.20 mm) wear in 30 minutes.
 - 3. Reflectivity: Increase of 35 percent as determined by standard gloss meter.
 - a. ASTM E 430, "Standard Test Methods for measurement of Gloss or High-Gloss Surfaces by Abridged Goniophotometry."
 - 4. Waterproof Properties: RILEM Test Method 11.4, 70 percent or greater reduction in absorption.
 - 5. High Traction Rating after Polishing: NFSI 101-A, non-slip properties.
 - a. Static Coefficient of Friction: For Polished Concrete Floors, all walkway surfaces shall comply with the ADA Requirements and the following minimum values as determined by testing identical products per ASTM C 1028 "Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method:"
 - 1) Level Surfaces: Minimum 0.6.
 - 2) Ramps: Minimum 0.8.
- B. Design Requirements:
- 1. Verify Hardened Concrete Properties:
 - a. Minimum new concrete compressive strength Minimum 3,500 psi required.
 - b. Floor slab to be polished is Normal Weight Concrete.
 - 1) That no Lightweight Aggregate Concrete is used in the mix.
 - 2) That no Air Entrained Concrete Admixture is used in the mix.
 - 2. Verify Placement Properties:
 - a. That the natural concrete slump of concrete mix was between 4-1/2 inches – 5 inches.
 - b. Flatness and Levelness Requirements in accordance with ASTM E 1155 "Standard test method for Determining FF (Floor Flatness) and FL (Floor Levelness) Numbers:"
 - 1) Flatness: SOV, greater than FF 45, MLV, greater than FF 30.
 - 2) Levelness: SOV, greater than FL 35, MLV, greater than FL 24.
 - 3. Verify that the finish of the concrete slab was accomplished with Hard-Steel Trowels, and that the minimum passes for the slab was at least three (3) passes, and that there were no burn marks.
 - a. Finish shall comply with ACI 302.1R, Class 5 Floor.
 - 4. Verify that the Curing Options used for the floor slab were at least one of the following:
 - a. Sheet membrane (ASTM C 171 "Specification for Sheet materials for Curing Concrete").
 - 1) Polyethylene Film is NOT ALLOWED.
 - b. Damp Curing Process:
 - 1) Seven Day Cure minimum.
 - 5. Verify that no Spray-On "Cure and Seal" curing compounds were used.

1.5 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
- 1. Product Data.
 - a. Submit product data for specified products.
 - b. Material Safety Data Sheets (MSDS).
 - c. Standard Colored Concrete dyes or stains for selection by the Architect.
 - d. Joint and Crack filler color range for selection by the Architect.
 - 2. Shop Drawings.
 - a. Typical layout showing the colored concrete treatment areas per color choice.
 - b. Typical layout including dimensions and floor grinding schedule.

- c. Plan view of floor and joint pattern layout.
- 3. Quality Assurance/Control Submittals:
 - a. Test Reports:
 - 1) Submit three (3) copies of reports.
 - a) Certified test reports showing compliance with specified performance characteristics and physical properties as cited in Design Requirements article.
 - b) Manufacturers Field Reports indicating that the manufacturer has read and instructed the installer of the proper procedures in regards to the Manufacturer's installation instructions prior to the start of the Polishing Operations.
 - c) Manufacturers Field Reports indicating Installers compliance with Manufacturer's Installation Instructions at the end of the Polishing Operations.
 - b. Certificates:
 - 1) Submit three (3) copies of certificates.
 - a) Product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria, and physical requirements.
 - b) Letter of certification from the National Floor Safety Institute confirming the system has been tested and passed phase Two Level of certification when tested by Method 101-A.
 - c) Current contractor's certificate signed by manufacturer declaring contractor as an approved installer of polishing system.
 - c. Manufacturer's Written Instructions:
 - 1) Submit three (3) copies of manufacturer's written procedural instructions.
- 4. Closeout Submittals in accordance with the following:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Record Documents in accordance with Specification Section - RECORD DOCUMENTS.
 - c. Warranty in accordance with Specification Section - WARRANTIES.

1.6 QUALITY ASSURANCE

A. Qualifications:

- 1. Installer Qualifications:
 - a. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
 - b. Installer trained and holding current manufacturer's certification for Polished Concrete Finish installation.
 - 1) Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions and data sheets.
 - 2) Use only manufacturer certified Polished Concrete Finishing installers.
 - 3) Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
- 2. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.

B. Regulatory Requirements:

- 1. In accordance with Specification Section - REGULATORY REQUIREMENTS.

C. Mockups:

1. Mock-Up Size: One 100 ft² sample panel at jobsite at location as directed under conditions similar to those which will exist during actual placement.
 - a. Mockups shall be located in a space that is not visible to the public, such as ancillary spaces, maintenance rooms, mechanical rooms, or rooms that will receive carpet. Refer to Finish Schedule.
 - b. Mockup grinding grades GGL II thru III for each color and finish for the Architect to select.
 - c. Show:
 - 1) Several intensities of colors for selection by Architect. More intense dye concentrations may be required to achieve color.
 - 2) Colors immediately adjacent to show workmanship in control of pattern.
 - 3) Partial sample of graphic at 100% scale.
 - 4) Partial sample of pattern: filled joints, colored, scored.
2. Allow 24 hours for inspection of mock-up before proceeding with work.
3. Mock-up will be used to judge workmanship, concrete substrate preparation, operation of equipment, material application, polished concrete shine, color, and proposed protection methods during construction.
 - a. Coordinate with Specification Section – CAST-IN-PLACE CONCRETE for Integral Color applications and color selections.
4. Remove mock-up and dispose of materials when no longer required and when directed by the Architect.

D. Meetings:

1. New Concrete: Schedule prior to the concrete pour.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements, such as:
 - 1) Environmental requirements.
 - 2) Concrete mix requirements.
 - 3) Concrete curing requirements.
 - 4) Concrete protection requirements.
2. Pre-Installation: Schedule prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements, such as:
 - 1) Environmental requirements.
 - 2) Scheduling and phasing of work.
 - 3) Coordinating with other work and personnel.
 - 4) Protection of adjacent surfaces.
 - 5) Surface preparation.
 - 6) Repair of defects and defective work prior to installation.
 - 7) Cleaning.
 - 8) Preparation and application of the Stains or Dyes to the floor areas in compliance with the floor coloring plan.
 - 9) Application of liquid hardener, densifier.
 - 10) Installation of polished floor finishes.
 - 11) Protection of finished surfaces after installation.
3. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.

4. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems, which may impede issuance of warranties or guaranties.
 - b. Maintaining installed work until the Final Inspection by the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, handling, and unloading:
 1. Products shall be handled in such a manner as to assure that they are free from damage.
 2. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
 3. Delivery:
 - a. Deliver materials in manufacturer's original packaging with identification labels and seals intact.
- B. Acceptance at Site:
 1. Damaged products will not be accepted.
 2. Products must be in manufacturer's original unopened containers with labels indicating brand name, product number, and grade.
- C. Storage and protection:
 1. Storage and Protection:
 - a. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 - 1) Store under cover in a cool place with temperatures between 40 and 90 degrees F. Protect from freezing. Don't stack packages or buckets more than three high.
 - b. Protect concrete slab prior to stains, dyes, and polishing:
 - 1) Protect from petroleum stains during construction.
 - 2) Diaper hydraulic power equipment.
 - 3) Restrict vehicular parking.
 - 4) Restrict use of pipe cutting machinery.
 - 5) Restrict placement of reinforcing steel on slab.
 - 6) Restrict use of acids or acidic detergents on slab.
 - 7) Restrict use of adhesives on slab.
 2. Waste Management and Disposal:
 - a. Remove from site and legally dispose of packaging materials.

1.8 PROJECT CONDITIONS

- A. Environmental requirements:
 1. Dust control: Perform work in a manner as to minimize the spread of dust and flying particles.
 2. Rain: The work under this section shall not be started or maintained under threat of rain unless the work is not affected by the rain.
 3. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.
 4. Temporary Lighting: Provide a minimum 200W light source, placed 8 feet above floor surface, for each 425 sq ft of floor being finished.
 5. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.
 6. Verify that the concrete surface meets the Design Requirements within this specification.
- B. Existing Conditions:

1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.

1.9 SEQUENCING AND SCHEDULING

- A. Sequence with Other Work: Comply with manufacturer's written recommendations for sequencing construction operations. It is imperative that this work be done before any framing is in place upon the slab, otherwise the consistency of the finish would be compromised if done at a later date within the construction operations.
 1. Grinding:
 - a. Identify the areas of existing or new slab construction, and coordinate the Grinding Grade Level required for each area.
 2. Integral Color and Polishing:
 - a. Provide integral color within the concrete mix at the time of pouring the slab, then allow a minimum of 28 days (but no more than 60 days) before the polishing operations begin.
 3. Dye and Polishing:
 - a. Provide dye operations in accordance with manufacturer's written instructions before the polishing operations begin.
 4. Stain and Polishing:
 - a. Provide stain operations in accordance with manufacturer's written instructions before the polishing operations begin.

1.10 WARRANTY

- A. Contractor's General Warranty:
 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period: One (1) Year.
- C. Installer's Warranty:
 1. In accordance with the terms of the Specification Section - WARRANTIES
 - a. Warranty Period: One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 1. Specified Polishing Concrete Finishing product manufacturer:
 - a. L & M CONSTRUCTION CHEMICALS: "PermaShine System."
 - b. Acceptable alternative manufacturers:
 - 1) ADVANCED FLOOR PRODUCTS: "RetroPlate 99."
 - 2) AMERIPOLISH

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- 3) DAYTON SUPERIOR: "Diamond Polish Floor Systems."
 - 4) DIAMATIC: "Ultraflor."
 - 5) THE BOMANITE CO.: "Manufacturer's Standard."
 - 6) PERFECT POLISH: "Natural Wonder Floor System."
 - 7) SCHOFIELD: "Formular One."
 - 8) W.R.MEADOWS: "Indurashine."
2. Specified Concrete Dye product manufacturer:
 - a. L & M CONSTRUCTION CHEMICALS, INC.: "Vivid Concrete Dyes."
 - b. Acceptable alternative manufacturers:
 - 1) ADVANCED FLOOR PRODUCTS: "Manufacturer's Standard."
 - 2) AMERIPOLISH: "Manufacturer's Standard."
 - 3) DIAMATIC: "Manufacturer's Standard."
 - 4) DAYTON SUPERIOR: "Pro Aqua Vivid Dyes."
 - 5) THE BOMANITE CO.: "Pantene Teres Dyes."
 - 6) PERFECT POLISH: "Manufacturer's Standard."
 - 7) SCHOFIELD: "Formula One" Liquid Dye Concentrate.
 3. Specified Hardener / Densifier product manufacturer:
 - a. L & M CONSTRUCTION CHEMICALS, INC.: "FGS Hardener Plus."
 - 1) Acceptable alternative product manufacturers:
 - a) AMERIPOLISH "3D HS" & "SR2."
 - b) THE BOMANITE CO.: "StabilizerPro."
 - c) THE BOMANITE CO.: "VitraFinish."
 - d) DYAMATIC: "Flor-Sil" Densifier and "Flor-Finish" Finish
 - e) W.R.MEADOWS: "Bellatrix" or "Liqui-Hard."
 4. Specified Joint Filler product manufacturer:
 - a. L & M CONSTRUCTION CHEMICALS, INC.: "Joint Tite 750."
 - 1) Acceptable alternative product manufacturers:
 - a) EUCLID CHEMICAL: "Quick Joint 200."
 5. Specified Protective Cover product manufacturer:
 - a. RAM BOARD: "Ram Board."
 - 1) Acceptable alternative product manufacturers:
 - a) McTECH GROUP: "EZcover."
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Products:
1. Integral Color: See Specification Section – CAST-IN-PLACE CONCRETE.
 2. Water shall be potable.
 3. Concrete Dyes:
 - a. Provide fast-drying dye, packaged in premanufactured units ready for mixing with VOC Exempt Solvent, formulated for application to polished cementitious surfaces.
 - 1) Provide manufacturer's Standard Color Options for selection by Architect.
 4. Concrete Stains:
 - a. Water-Based, penetrating, reactive stains, that creates a chemical reaction within the concrete substrate, and formulated for application to polished concrete surfaces.
 - 1) Provide manufacturer's Standard Color Options for selection by Architect.
 - 2) No "Acid Etching Stains" allowed.
 5. Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A 80 or higher hardness.

6. Hardener / Densifier: Water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film.

2.3 FINISHES

- A. Gloss Reading Standards, in accordance with ASTM E 430, "Standard Test Methods for measurement of Gloss or High-Gloss Surfaces by Abridged Goniophotometry".
 1. GL-1 (Matte) 50 grit.
 - a. Gloss Reading: 2.
 - b. Maximum Level of Slip Resistance (COF): 0.747.
 - c. Mohs Hardness Factor Range: 4.5.
 2. GL-2 (Matte) 120 grit.
 - a. Gloss Reading: 4.
 - b. Maximum Level of Slip Resistance (COF): 0.733.
 - c. Mohs Hardness Factor Range: 5.0.
 3. GL-3 (Matte) 220 grit.
 - a. Gloss Reading: 7.
 - b. Maximum Level of Slip Resistance (COF): 0.76.
 - c. Mohs Hardness Factor Range: 5.5.
 4. GL-4 (Low Sheen) 400 grit.
 - a. Gloss Reading: 23-25.
 - b. Maximum Level of Slip Resistance (COF): 0.803.
 - c. Mohs Hardness Factor Range: 7.0.
 5. GL-5 (Semi-Gloss) 800 grit.
 - a. Gloss Reading: 38-42.
 - b. Maximum Level of Slip Resistance (COF): 0.656.
 - c. Mohs Hardness Factor Range: 7.5.
 6. GL-6 (Semi-Gloss) 1800 grit.
 - a. Gloss Reading: 46-52.
 - b. Maximum Level of Slip Resistance (COF): 0.635.
 - c. Mohs Hardness Factor Range: 7.5.
- B. Verification of Performance:
 1. Ensure concrete finishing components and materials are from a single manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual which, affect the execution of work under this specification section.
 2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Coordination:
 1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
- B. Protection:

1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.
- C. Surface preparation:
 1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
 2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.
 3. Determine the Grind Grade level related to the depth of cut, indicating the amount of aggregate that is to be revealed during the initial grinding of the surface:
 - a. GGL-I - Grind Grade Level I (Cream Finish):
 - 1) Grinding only the Portland Paste at the surface of the substrate without exposing small, medium or large aggregate.
 - b. GGL-II - Grind Grade Level II (Salt and Pepper Finish):
 - 1) Exposing the fine aggregate such as sand and small aggregate within the substrate. Generally, this level of grind can be achieved within 1/16 inch of the surface.
 - c. GGL-III - Grind Grade Level III (Medium Aggregate):
 - 1) Exposing more of the overall girth of the aggregate within the substrate. Generally, this level of grind can be achieved within 1/8 inch of the surface.
 - d. GGL-IV - Grind Grade Level IV (Large Aggregate):
 - 1) Exposing more of the overall girth of the aggregate within the substrate. Generally, this level of grind can be achieved within 1/4 inch of the surface.

3.3 INSTALLATION

- A. General:
 1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
 2. In accordance with approved submittals.
 3. In accordance with Regulatory Requirements.
 4. Provide planetary heads and orbiting machinery for a consistent and unburnished polishing effect.
- B. Layout:
 1. Lines shall be straight and true, except otherwise indicated.
 2. In accordance with approved joints and floor pattern.
- C. Assistance:
 1. Application shall be in direct consultation and review of the manufacturer.
- D. Floor Surface Polishing and Treatment:
 1. Integral Color: See Specification Section – CAST-IN-PLACE CONCRETE.
 2. Provide polished concrete floor treatment in entirety of slab indicated by drawings. Provide consistent finish in all contiguous areas.
 3. Apply floor finish prior to installation of fixtures and accessories.
 4. Dyed and Polished Concrete:
 - a. Locate demarcation line between dyed surfaces and other finishes.
 - b. Polish concrete to final finish level.
 - c. Apply selected diluted dyes to polished concrete surface in accordance with manufacturer's written recommendations.
 - d. Allow dye to dry.
 - e. Remove residue with dry buffer, reapply as necessary for desired result.
 - f. Score pattern lines from 1/16 inch to 1/8 inch deep between color changes.
 5. Apply Hardener / Sealer / Densifier as follows:
 - a. First coat at 250 ft²/gal. (or per manufacturer's written recommendations).
 - b. Second coat at 350 ft²/gal. (or per manufacturer's written recommendations).

- c. Follow manufacturer's recommendations for drying time between successive coats.
 - 6. "Diamond" grit-polish concrete floor surfaces with planetary/rotary power disc machine recommended by floor finish manufacturer. Sequence with coarse to fine diamond grit using dry method.
 - a. Comply with manufacturer's recommended diamond polishing grits for each sequence to achieve desired finish level. Level of sheen shall match that of approved mock-up.
 - b. Expose aggregate in concrete surface only as determined by approved mock-up.
 - c. All concrete surfaces shall be as uniform in appearance as possible.
 - 7. Grind & polish perimeter and edges to match field. Hand tools and multiple passes may be required to achieve uniform finish. Visible change in finish from field finish will not be accepted.
 - 8. Remove defects and re-polish defective areas.
 - 9. Finish edges of floor finish adjoining other materials in a clean and sharp manner.
- E. Burnishing
 - 1. Utilizing a burnishing machine with 1,500 grit diamond impregnated pads, provide two (2) burnishings, requiring re-mobilization at the end of the project.
 - a. 1st Burnish Upon completion of floor surface polishing and treatment.
 - b. 2nd Burnish Just prior to occupancy / stocking / moving-in.

3.4 ADJUSTING

- A. Polish to higher gloss those areas not meeting specified gloss levels per mock-up.
- B. Fill joints greater than 1/8 inch deep flush to surface with color-matching material.
- C. Fill cracks greater than 1/8 inch deep flush to surface with color-matching material.

3.5 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
 - 1. Leave area free of debris.
 - 2. Clean any soiled surfaces immediately.
 - 3. Finish shall be clean and ready for the application of any additional finishes.
 - 4. In accordance with manufacturer's written instructions and recommendations.

3.6 PROTECTION

- A. Protection from traffic:
 - 1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.

END OF SECTION

SECTION 05 12 00 – STEEL AND FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all Steel and Fabrications, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 11 01 CONCRETE FORMWORK
 - 4. 03 15 14 DRILLED ANCHORS
 - 5. 03 20 00 REINFORCEMENT
 - 6. 03 30 00 CAST-IN-PLACE CONCRETE for Grouting of Bearing Plate.
 - 7. 06 10 00 ROUGH CARPENTRY
 - 8. 06 41 23 MODULAR CASEWORK
 - 9. 07 21 00 INSULATION
 - 10. 07 40 00 METAL PANELS
 - 11. 07 60 00 SHEET METAL
 - 12. 07 72 00 ROOF ACCESSORIES
 - 13. 08 11 00 METAL DOORS AND FRAMES
 - 14. 08 70 00 HARDWARE
 - 15. 09 22 16 METAL FRAMING
 - 16. 09 50 00 ACOUSTICAL CEILINGS
 - 17. 09 91 00 PAINTING
 - 18. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 19. 10 44 00 FIRE PROTECTION SPECIALTIES
 - 20. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 21. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with Specification Section – REGULATORY REQUIREMENTS and the following standards:
 - a. AISC: American Institute of Steel Construction "Specification for Design, Fabrication and Erection of Structural Steel buildings" and "Code of Standard Practice for Steel Buildings and Bridges" and "Recommended Procedure for Identification of High Strength Steels During Fabrication."
 - 1) NOTE: All connections shall be designed by the Structural Engineer and approved by [DSA/SSS][HCAI][AHJ].
 - 2) NOTE: All connections shall be as shown in the Contract Document drawings.
 - 3) AISC: "Architecturally Exposed Structural Steel" 2016 AISC "Code of Buildings and Bridges," Section 10.
 - 4) AISC: "Specification for Structural Steel Buildings" using the AISC 360-16.

- 5) AISC 341-16 Seismic Provisions.
- b. ANSI: American National Standards Institute:
 - 1) ANSI B18.22.1 "Plain Washers."
 - 2) ANSI B18.22.1 "Beveled Washers."
- c. ASTM: American Society for Testing and Materials.
 - 1) ASTM A 123: Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
 - 2) ASTM A 153: Standard Specification for Zinc (Hot-Dip) on Iron and Steel Hardware.
 - 3) ASTM A 385: Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
 - 4) ASTM A 780: Standard Specification for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- d. AWS: American Welding Society "Structural Welding Code."
 - 1) AWS D1.1 "Structural Welding Code."
 - 2) AWS D1.8 "Structural Welding Code - Seismic Supplement."
 - 3) AWS A2.4 "Standard Symbols for Welding, Brazing, and Nondestructive Examination."
- e. ICC: International Code Council
- f. NAAMM: National Association of Architectural Metal Manufacturers
 - 1) Metal Stairs Manual
 - 2) Pipe Rail Manual.
- g. RCSC: Research Council on Structural Connections, "Specification for Structural Joints Using High-Strength Bolts."
- h. SSPC: The Society for Protective Coatings.
 - 1) SSPC-SP 1 "Solvent Cleaning."
 - 2) SSPC-SP 2 "Hand Tool Cleaning."
 - 3) SSPC-SP 3 "Power Tool Cleaning."
 - 4) SSPC-SP 6 "Commercial Blast Cleaning."
 - 5) SSPC-SP 7 "Brush-Off Blast Cleaning."

1.3 DEFINITIONS

- A. AESS: Architecturally exposed structural steel.
- B. Welding Definitions:
 - 1. CVN Charpy V-Notch (Testing Procedure).
 - 2. FCAW Flux Core Arc Welding.
 - 3. FCAW-G Flux Core Arc Welding-Gas Shielded.
 - 4. FCAW-SS Flux Core Arc Welding-Self Shielded.
 - 5. G-MAW Gas Metal Arc Welding.
 - 6. SMAW Shielded Metal Arc Welding.
 - 7. SAW Submerged Arc Welding.

1.4 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
- B. Product Data.

- a. Submit Load Indicating Device information as indicated in Part 3 of this Specification Section and include Laboratory Test Reports and other data to show compliance with Specification (include Specified Standards).
 - b. Include certified copies of mill reports covering chemical and physical properties of each type of steel.
 - c. Submit primer paint system. Obtain certification from the project's Painting Contractor and Paint Manufacturer that primer paint system is compatible with proposed painting systems for this project.
- C. Shop Drawings.
1. The Contract Drawings represent the spatial relationship as conceived by the Architect.
 - a. The production of the structural steel Shop Drawings may require the employment and utilization of a 3-dimensional structural steel fabrication layout program to achieve the exact relationship of all intersecting members.
 - b. Building sections and details represent interpretations of these relationships and the dimensions shown shall not be relied upon for accuracy and fit, but the Contractor / Structural Steel Fabricator shall verify them and double-check them for accuracy and fit.
 - c. Any significant variations shall be submitted to the Architect and Structural Engineer for review and approval, of which the conditions may or may not require [DSA/SSS][HCAI][AHJ] review and approval.
 - d. "Fit-Up" means and methods are the sole responsibility of the Contractor.
 2. Provide all information necessary for the fabrication of component parts. Indicate size and weight of members, type and location of shop and field connections, size and extent of all welds, and welding sequence when required.
 3. Include details of cuts, connections, camber, holes and other pertinent data. Include welds by Standard AWS Symbols, and show size, length and type of each weld.
 4. Provide sections, drawings, templates and directions for installation of anchor bolts and other anchors.
 5. Dimension requirements of structural steel for manufactured items, such as Mechanical Equipment, Dock Levelers, etc. All of these items shall be coordinated and provided by the General Contractor. The General Contractor shall also coordinate and provide dimensions to locate Structural Steel for Window Washing supports such as davits, tie-backs, etc.
- D. Shop Drawings for fabrication of AECS components.
1. Identify AECS category for each steel member and connection, including transitions between AECS categories and between AECS and non-AECS.
 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 3. Include embedment Drawings.
 4. Indicate orientation of mill marks and HSS seams.
 5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
 6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections. Indicate orientation and location of bolt heads.
 7. Indicate exposed surfaces and edges and surface preparation being used.
 8. Indicate special tolerances and erection requirements.
 9. Indicate weep holes for HSS and vent holes for galvanized HSS.
 10. Indicate surface preparation, primer, and coating requirements, including systems specified in other Sections.
- E. Samples.
1. Provide material samples cut and machined for testing without charge to the Owner.
- F. Quality Assurance/Control Submittals.
1. Test Reports:

- a. Submit mill analysis and test reports for each heat, in accordance with ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use," certifying conformity with the Specifications. Steel shall be identifiable in the fabricating shop.
 - b. Submit test reports for each lot of high strength bolts in accordance with ASTM F 3125 "Standard Specification For High Strength Structural Bolts And Assemblies, Steel And Alloy Steel, Heat Treated, Inch Dimensions 120 Ksi And 150 Ksi Minimum Tensile Strength, And Metric Dimensions 830 MPa And 1040 MPa Minimum Tensile Strength" for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength."
 - c. Submit Welding Procedure Specification (WPS) to the Structural Engineer for review prior to use.
 - 1) For WPS's that have been qualified by test, the supporting Procedure Qualification Record (PQR) shall be submitted to the Structural Engineer for review prior to use.
 - d. Submit to the Structural Engineer for approval, a step-by-step welding sequence for the field welding of each type of connection.
 - e. Submit to the Structural Engineer a quality control plan that addresses all inspection issues, including in process and final inspection that are addressed in AWS D1.1.
2. Certificates:
- a. Submit current valid certificate issued by an independent testing agency for all welders, welding operators, and tack welders.
 - b. Certification of Welder's Qualifications: Welders that will make welds in restricted access, such as, but not limited to, the bottom flange-to-column welds through a cope hole or access hole in the beam web, shall be qualified by the Contractor using the same welding procedure as will be used for production and a mock-up assembly that simulates the construction configuration.
 - c. Provide Certified Mill Test Report Sheets in accordance with ASTM A123 "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products," certified at the plant after galvanizing, but prior to shipment.
- G. Closeout Submittals:
- 1. Project Record Documents in accordance with Specification Section - PROJECT DOCUMENTS.
 - 2. Warranty.

1.5 QUALITY ASSURANCE

A. Qualifications:

- 1. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 - b. Welders shall be recently qualified by Test as prescribed in AWS "Structural Welding Code" for the type of welding to be performed.
 - 1) All welders, welding operators, and tack welders shall be qualified with the largest diameter electrode(s) to be used on the work by test and hold a current valid certificate issued by an independent testing agency, to perform the type of welds required by the work; including the process, position, and thickness of materials used (AWS D1.1: Clauses 3 & 4 Sections).
 - 2) In addition to meeting the requirements of AWS, welders that will make welds with restricted access, such as, but not limited to, the flange to column welds through a cope hole or access hole in the beam web, or where access to the bottom of a groove is restricted by the presence of a column flange, shall be qualified by the Contractor using the same welding

procedure as will be used for production and a mock-up assembly that simulates the construction configuration.

- 3) All welders on the project shall be capable of understanding and following the requirements of the written WPS.
- 4) Each welder employed on the project shall understand all the requirements of this welding specification before welding on the project.
- 5) The written WPS shall be available to the welder, welding supervisor, and all inspectors.
- 6) Provide weld procedures for both pre-qualified welds and special welds to be submitted to the Owner's Testing laboratory and the Architect. Procedures shall be provided for both shop & field welds and shall be provided prior to commencing welding operations.

2. Manufacturer/Supplier Qualifications:

- a. Structural Steel firm experienced in successfully producing/supply capacity to produce/supply required units without causing delay in the Work.
- b. Provide documentation that the Hot-Dipped Galvanizer is a member in good association with the AGA (American Galvanizers Association).

3. Metal Stair Qualifications:

- a. For all surfaces exposed to view, use materials, that are smooth and free of surface blemishes including pitting, seam marks, rolled trade names and roughness.
- b. All loading conditions resulting in eccentricities or torsion to beams and/or columns shall be resolved by the Installation of stiffeners and diagonal struts designed, supplied, and installed by the stair supplier.
- c. Take field measurements prior to preparation of shop drawings and fabrication; do not delay job progress; allow for trimming and fitting where necessary.
- d. Concrete for treads and landings shall attain a minimum strength of 3,000 psi in 28 days.
- e. Metal stairs and intermediate landings:
 - 1) Stair pans and risers shall be a minimum of 10-gauge material. Actual gauge as required by design.
 - 2) Stringer and member sizes indicated on drawings shall be the minimum sizes allowed. Flat plate stringers are not acceptable substitutions.

B. Regulatory Requirements:

1. In accordance with Specification Section - REGULATORY REQUIREMENTS.

C. Mockups:

1. A typical mockup of welded connections shall be provided prior to shop fabrication.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Product Handling:

1. Store materials to permit easy access for inspection and identification. Keep steel members off the ground using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

1.7 SCHEDULING

- A. Schedule the Work so that there will be no excessive inspection time. At all times that an inspector is required, sufficient work shall be laid out and adequate personnel supplied so that the Inspector's time will be used to full advantage. If inspection costs become excessive because of poor shop procedure, such excess costs will be paid for by the Owner, but deducted from the Contract Price. Poor procedures will be determined upon review of Inspection and/or Testing Reports. The rate for charging the excess costs will be as follows:

1. Minimum of three (3) certified welders are used, Owner will pay 100 percent.
2. Only two (2) certified welders are used, Contractor will be charged 1/3 of the Inspection cost.
3. Only one (1) certified welder is used, the Contractor will be charged 2/3 of the inspection cost.

1.8 WARRANTY

- A. Contractor's General Warranty:
 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.
- C. Installer's Warranty:
 1. In accordance with the terms of the Specification Section - WARRANTIES
 - a. Warranty Period One (1) Year.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The products listed establish size, pattern, color range and function selected by the Architect for this Project. Acceptable alternatives and substitutions must comply with the requirements of this project. If the acceptable alternatives or substitutions are not approved due to non-compliance with the contract documents, then the Contractor shall submit the specified product.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Steel:
 1. Structural Shapes, Plates, and Bars: Shall be made in accordance with ASTM A 36, "Specifications for Carbon Structural Steel."
 - a. ASTM A 572, "Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel," Grade 50.
 - b. ASTM A 992, "Standard Specification for Steel for Structural Shapes for use in Building Framing" Grade 50.
 2. Pipe: Shall be in accordance with "Specifications for Welded and Seamless Steel Pipe," ASTM A 53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless," Grade B, or otherwise noted.
 - a. Finish: Type E, for concealed conditions, Black, except where indicated on the drawings to be galvanized.
 - b. Finish: Type S, for visually exposed conditions, Black, except where indicated on the drawings to be galvanized.
 3. Structural Tubes:
 - a. Cold-Formed tubing: Shall be in accordance with ASTM A 500 "Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes," Grade B.
 - b. Hot-Formed tubing: Shall be in accordance with ASTM A 501 "Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing."
 - c. All HSS sections (round and square) shall have their material certifications reviewed by the special inspector.

- 1) The special inspector shall verify that all seam welds are fused in accordance with ASTM A 500 "Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes," Grade B.
 - 2) The special inspector shall, as a minimum, visually inspect the exterior of all seam welds.
- B. Light Gauge Cold Formed Shapes: In accordance with the following, unless otherwise noted on the Structural Engineer's Drawings:
1. ASTM A 653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process," such as "Zee" purlins, angles bent plated, etc.
 2. ASTM A 1011 "Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability."
- C. Bar Grating: Shall be primed for field finish painting, overall sizes as indicated on the drawings.
1. "Welded bar grating" as manufactured by McNICHOLS COMPANY, or approved equivalent.
 - a. Model Number: #GW-150A.
 - 1) Use Type "C" galvanized steel fasteners.
 - 2) Fill all grind marks, pits and pockets on exposed faces in the body putty, sand smooth and prep for finish.
 - 3) Miter cut all corners and angle connections. Remove all slag, grind all welds smooth, and on flat surfaces, grind flush with flat surface.
 - b. Model Number: #GW-200-2.
 - 1) Use Type "CB" galvanized-steel grate fasteners.
 - c. "Sunscreen":
 - 1) Model: #GW-250.
 - 2) 17.4 lbs/sq.ft. Heavy Duty Galvanized Steel.
 - 3) Cut to fit with Type "CB" galvanized steel grate fasteners.
 2. Aluminum Bar Grating:
 - a. Specified Aluminum Bar Grating product manufacturer, or approved equivalent:
 - 1) IKG BORDEN "I-Bar IB."
 - b. Material to be 6063 aluminum alloy, weight 4.0 lbs./sq. ft.
 - c. Depth of bearing bar to be 2-1/2 inch spaced on 1-3/16 inch centers, Standard panel width to be 13-5/16 inches.
 - d. Space cross bar at 4-inch on center.
 - e. Punch the bearing bar to receive the cross bar.
 - f. Notching, slotting, or cutting the top or bottom flanges of the bearing bars to receive cross bars will not be permitted.
 - g. Cross bars shall be secured to the main bearing bars by a swaging process to prevent turning, twisting or coming loose.
 - h. Ends of cross bars to be trimmed flush with outside face of bearing bars.
 - i. Trimming will be made in such a manner as to prevent destruction of swagged lock on bearing bar.
- D. Panels:
1. Perforated Panels (Type 1):
 - a. Manufacturer: McNICHOLS COMPANY.
 - b. Quantity: Continuous Sheet with no joints.
 - c. Material: Stainless Steel, Type 304, #4 Finish.
 - d. Thickness: 18 Gauge.
 - e. Width and Length: See Drawings.

- f. Perforation: 3/32" dia. With 1/4 inch staggered center, 11% open area.
- g. Panel Ends and Edges: 1" margin at perimeter with hemmed edges.
- h. Panel Fasteners:
 - 1) Manufacturer: HAFELE.
 - 2) Sleeve Nut: 1/4-20 JCN Nut Screw, 267.10.617.
 - 3) Material: Nickel Plated Steel.
 - 4) Width and Length: 17 mm x 19 mm.
 - 5) Threaded Stud: Match Sleeve Nut Threading.
 - 6) Spacer Tube: Stainless Steel, to fit over Sleeve Nut (9 mm).
- 2. Perforated Panels (Type 2):
 - a. Manufacturer: McNICHOLS COMPANY.
 - b. Quantity: Continuous Sheet with no joints, curved to profile on drawings.
 - c. Material: Carbon Steel, polished, clear light oil finish, unprimed.
 - d. Thickness: 22 Gauge.
 - e. Width and Length: 48" x 120".
 - f. Perforation: 5/32" dia. With 7/32 inch staggered centers, 46% open area.
 - g. Panel Ends and Edges: 1" margin at perimeter with hemmed edges.
- 3. Non-Perforated Solid Panels (Type 3):
 - a. Manufacturer: McNICHOLS COMPANY.
 - b. Quantity: Continuous Sheet with no joints.
 - c. Material: Stainless Steel, Type 304, #8 Finish.
 - d. Thickness: 18 Gauge.
 - e. Width and Length: See Drawings.
- 4. Non-Perforated Solid Panels (Type 4):
 - a. Manufacturer: McNICHOLS COMPANY.
 - b. Quantity: Formed Cylindrical "Can" shape, with smooth welded edges.
 - 1) See drawings – no burrs or sharp edges allowed.
 - c. Material: Stainless Steel, Type 304, #4 Finish.
 - d. Thickness: 18 Gauge.
 - e. Width and Length: See Drawings.
- E. Wire Cloth: Galvanized Steel as manufactured by McNICHOLS COMPANY:
 - 1. Plain Weave, 1" square opening
 - a. (1" x 1") x 0.135 inch diameter (ID Gauge).
 - 2. Woven Weave, 1" square opening
 - a. (1" x 1") x 0.135 inch diameter (ID Gauge).
- F. Plastic Steel Putty:
 - 1. Specified Plastic Steel Putty product manufacturer, or approved equivalent:
 - a. DEVCON Plastic Steel Putty A.

2.3 COMPONENTS

- A. Fasteners shall be in accordance with the following, unless otherwise noted on the Structural Engineer's Drawings:
- B. Anchor Bolts:
 - 1. All anchor bolts cast in concrete or masonry shall be headed bolts with cut threads conforming to:
 - a. ASTM F 1554 "Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength."

- C. Machine Bolts:
 - 1. ASTM A 307 "Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength."
- D. Direct Tension Indicators:
 - 1. Provide in accordance with ASTM F 959 "Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners," type as required.
 - a. Use on all bolts for ASTM F 3125 "Standard Specification For High Strength Structural Bolts And Assemblies, Steel And Alloy Steel, Heat Treated, Inch Dimensions 120 Ksi And 150 Ksi Minimum Tensile Strength, And Metric Dimensions 830 MPa And 1040 MPa Minimum Tensile Strength."
- E. High Strength Bolts, Nuts and Washers: Install in accordance with requirements for ASTM F 3125 "Standard Specification For High Strength Structural Bolts And Assemblies, Steel And Alloy Steel, Heat Treated, Inch Dimensions 120 Ksi And 150 Ksi Minimum Tensile Strength, And Metric Dimensions 830 MPa And 1040 MPa Minimum Tensile Strength" slip critical and snug tight conditions as indicated on drawings. Install high strength bolts with snug tight type connections with threads included in shear plane except as otherwise noted. Install hardened washers in conformance with AISC Specifications.
 - 1. Bolt Geometry: Bolt dimensions shall conform to the current requirements of the American National Standards Institute for Heavy Hex Structural Bolts, ANSI Standard B18.2.1. The length of bolts shall be such that the end of the bolt will be flush with or outside the face of the nut when properly installed.
 - 2. Provide hexagonal heads and nuts for all connections per ASTM A 563 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process," Appendix Table X1.1.
 - 3. Nut Specifications: Nuts shall conform to the current chemical and mechanical requirements of the American Society for Testing and Materials Standard Specification for Carbon and Alloy Steel Nuts, ASTM A 563 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process," Appendix Table X1.1 Provide grade A Heavy Hex nuts for ASTM A 36 threaded rods. Use grade C, Heavy Hex nuts for ASTM A 572 "Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel" Grade 50 and ASTM A 588 "Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 Mpa) Minimum Yield Point to 4-inc (100-mm) Thick" threaded rod.
 - 4. Washers: Flat circular washers and square or rectangular beveled washers shall conform to the current requirements of the American Society for Testing and Materials Standard Specification for Hardened Steel Washers, ASTM F 436 "Standard Specification for Hardened Steel Washers."
 - 5. Tension Control Fastener System:
 - a. LOHR, LEJEUNE, NUCOR FASTENER, CORDOVA BOLT, INC., or approved equivalent.
- F. Stud-Type Shear Connectors: ASTM A 108 "Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality" Grade 1015 or 1020 Cold-finished carbon steel with dimensions complying with AISC Specifications.
- G. Power Driven Fasteners: Tempered steel pins with special corrosive resistant plating or coating. Pins shall have guide washers to accurately control penetration. Fastening shall be accomplished by low-velocity piston-driven power activated tool. Pins and tool shall be as manufactured by Hilti Fastening Systems.
- H. Filler Metal and Welding Flux in accordance with AWS D1.1 Clause 5 "Fabrication Section", and AISC 360, Section A3.5, and shall meet a CVN Impact Energy of 20 ft-lbs at minus 20 Degrees F.
 - 1. FCAW A5.20 or A5.29 E7XT-X.
 - 2. G-MAW A5.18 or A5.28 E70S-X.
 - 3. SAW A5.17 or A5.23 E7X-EXXX.
 - 4. SMAW A5.1 or A5.5 E70XX Low Carbon.

- I. Turnbuckles:
 - 1. ASTM F 1145, "Standard Specification for Turnbuckles, Swaged, Welded, Forged."
 - 2. The supplier shall provide turnbuckles manufactured from the same production lot.
 - 3. The manufacturer shall provide test reports indicating the safe load of the turnbuckles using a safety factor of 5.
 - 4. Turnbuckles shall be in compliance with ASTM F 606 "Standard Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, and Rivets."

2.4 FABRICATION

- A. Shop Assembly:
 - 1. Fabricate in accordance with AISC Spec and AISC Code unless otherwise indicated on Drawings or Specifications.
 - a. Mechanically curve specific Structural members as indicated on the drawings in accordance with AISC requirements and tolerances.
 - 2. Fabricate all structural steel members and fittings.
 - 3. Fabricate all miscellaneous metal fabrications scheduled in Part 3 of this Specification Section.
 - 4. Architecturally Exposed Structural Steel and "Exposed to View" Metal Fabrications:
 - a. Comply with AISC - "Architecturally Exposed Structural Steel" 2010 AISC "Code of Buildings and Bridges," Section 10.
 - b. At all exposed joints, continuous fill with Plastic Steel Putty. Sand smooth and uniform and ready to receive finishes.
 - 1) Clean all areas to have smooth seams with manufacturers recommended cleaner.
 - 2) Place Steel Putty and cure.
 - c. Also, refer to drawings.
- B. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with the AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated to provide the flattest floor possible. The contractor shall coordinate member tolerances with finishes.
 - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 - 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
 - 3. Columns:
 - a. All columns and beams shall adhere to Section M2.7 of the referenced "Specification for Structural Steel for Buildings" which states that completed members shall be free of twists, bends, and open joints.
- C. Connections: Weld or bolt shop connections, as indicated. Bolt field connections, except where welded connections or other connections are indicated.
- D. Unless noted otherwise, make holes 1/16 inches larger than the nominal bolt diameter.
 - 1. For anchor bolts, the hole diameter may not exceed the sizes indicated in CBC Section 2204A.4, nor what is specified on the drawings.
- E. Welding, Shop and Field: Weld by shielded arc method, submerged arc method, flux cored arc method, or other method approved by AWS. Perform welding in accordance with AWS Code. All welders, both manual and automatic, shall be certified in accordance with AWS "Standard Qualification Procedure" for the Work to be performed. See paragraph "welding" herein, for detailed requirements. If sizes of fillet welds are not shown on drawings, use AWS minimum weld size but not less than 3/16-inch fillet welds.

- F. Bolt Holes for Other Work: Provide holes required for securing other work to structural steel framing.
1. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
 2. Cut, drill or punch holes perpendicular to metal surfaces and remove all burrs. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- G. AISC Heavy Section shapes and built-up members shall meet the requirements for joints in AISC Sections J1.5, J1.6, J2.7 and M2.2.
- H. High Strength Bolts:
1. Installation and Tightening:
 - a. Handling and Storage of Fasteners: Fasteners shall be protected from dirt and moisture at the job site.
 - 1) Only as many fasteners as are anticipated to be installed and tightened during a work shift shall be taken from protective storage.
 - 2) Fasteners not used shall be returned to protected storage at the end of the shift.
 - 3) Fasteners shall not be cleaned of lubricant that is present in as-delivered condition.
 - b. Tension Calibrator: A tension measuring device shall be required at all job sites where bolts in slip-critical joints are being installed and tightened.
 - 1) The tension measuring device shall be used to confirm:
 - a) The suitability to satisfy the requirements of AISC for the complete fastener assembly, including lubrication if required to be used in the work,
 - b) Calibration of wrenches, if applicable, and
 - c) The understanding and proper use by the bolting crew of the method to be used.
 - 2) The frequency of confirmation testing, the number of tests to be performed and the test procedure shall be as specified in 1.d. below, as applicable.
 - a) The accuracy of the tension-measuring device shall be confirmed through calibration by an approved testing agency at least annually.
 - c. Joint Assembly and Tightening of Shear/Bearing Connections: Bolts in connections not within the slip-critical category shall be installed in properly aligned holes, but need only be tightened to the snug tight condition.
 - 1) The snug tight condition is defined as the tightness that exists when all plies in a joint are in firm contact.
 - 2) This may be attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
 - 3) If a slotted hole occurs in an outer ply, a flat hardened washer or common plate washer shall be installed over the slot.
 - d. Joint Assembly and Tightening of Connections Requiring Full Pre-tensioning. Slip-critical connections shall be installed in properly aligned holes and tightened by one of the following methods.
 - 1) Turn-of-nut Tightening: When turn-of-nut tightening is used, hardened washers are not required except as specified in the AISC.
 - a) A representative sample of not less than three bolts and nuts of each diameter, length and grade to be used in the work shall be checked at the start of work in a device capable of indicating bolt tension.

- b) The test shall demonstrate that the method of estimating the snug-tight condition and controlling turns from snug tight to be used by the bolting crews develops a tension not less than five percent greater than the tension required for slip-critical connections.
- 2) Installation of Alternate Design Bolts: A representative sample of not less than three bolts of each diameter, length and grade shall be checked at the job site in a device capable of indicating bolt tension.
 - a) The test assembly shall include flat-hardened washers, if required in the actual connection, arranged as in the actual connections to be tensioned.
 - b) The calibration test shall demonstrate that each bolt develops a tension not less than five percent greater than the tension required by AISC.
 - c) Manufacturer's installation procedure shall be followed for installation of bolts in the calibration device and in all connections.
 - d) When alternate design features of the fasteners involve an irreversible mechanism such as yield or twist-off of an element, bolts shall be installed in all holes of the connection and initially brought to a snug tight condition.
 - e) All fasteners shall then be tightened, progressing systematically from the most rigid part of the connection to the free edges in a manner that will minimize relaxation of previously tightened fasteners prior to final twist-off or yielding of the control or indicator element of the individual fasteners.
 - f) In some cases, proper tensioning of the bolts may require more than a single cycle of systematic tightening.
- e. Mark bolts that have been completely tightened with an identifying symbol.
 - 1) Final tightening of high strength bolts in webs of beam to column moment connections shall be performed after completion of flange welding.
- I. Welding - General:
 - 1. General: Quality of materials and design and fabrication of all welded connections shall conform to AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Building," AWS "Code for Welding in Building Construction," AWS "Structural Welding Code - Seismic Supplement," and requirements of this section.
 - a. Location and type of all welds shall be as shown. Make no other welded splices, except those shown on drawings, without prior approval of the architect.
 - 2. Automatic Welding: Use electrode wire and flux for automatic and semi-automatic welding acceptable to Architect. All methods, sequences, qualification and procedures, including preheating, and post heating if necessary, shall be detailed in writing and submitted to the architect for review.
 - 3. Qualification of Welders:
 - a. Structural steel welding: Manual and automatic welds for structural steel construction shall be made only by operators who have been previously qualified by tests, as prescribed in AWS D1.1 and D1.8 to perform type of work required.
 - b. Welders shall be checked by the welding inspector. Those not doing satisfactory work may be removed, and may be required to pass qualification tests again. All qualification testing shall be at the Contractor's expense.
 - c. Only welders whose weld procedures and pre-qualification by testing that have passed shall be considered qualified for such welds.
 - 4. Control cooling process after weld is completed by either step down post heat or thermal blankets as determined by procedures and prequalification.

5. Box columns and built-up members shall have ultrasonic testing before and after welding.
6. Flame cut surfaces shall be ground to remove contaminated steel layer to provide welds proper fusion without impurities.
7. Preparation of surface: Surfaces to be welded shall be free of loose scale, slag, rust, grease, paint and any other foreign material.
8. Welding equipment: Welding equipment to be used in each case shall be acceptable to welding inspector. Use equipment with suitable devices to regulate speed and manually adjust operating amperage and voltage. The amperage capacity shall be sufficient to overcome line drop, and to give adequate welding heat.
9. Remove runoff tabs and grind surfaces smooth where the tabs would interfere with fireproofing and architectural finishes.
10. End-welded studs:
 - a. Automatic end-welded studs: Automatically end-weld in accordance with the manufacturer's written recommendations in such a manner as to provide complete fusion between the end of the stud and the plates. There shall be no porosity or evidence of lack of fusion between the welded end of the stud and the plate. The stud shall decrease in length during welding approximately 1/8 inch for 5/8 inch, and 3/16 inch for 3/4 inch diameter. Stud sizes indicated on drawings represent the finish stud height.
 - b. Fillet-end welded studs: Studs may be welded using prequalified FCAW, GMAW, or SMAW processes provided the requirements of the AWS D1.1 Clause 7 "Stud Welding" are met as well as any other pertinent requirements of D1.1.
11. Provide mill camber as shown on the construction documents within AISC tolerance. Place mill tolerance upward for all beams specified no camber.
- J. Railing Systems: Assemble railing systems in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation. Use connections that maintain structural value of joined pieces.
 1. Form changes in direction of railing members as follows:
 - a. By bending (unless otherwise indicated by the contract documents).
 2. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
 3. Welded Connections: Fabricate railing systems and handrails for connecting members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:
 - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - b. Obtain fusion without undercut or overlap.
 - c. Remove welding flux immediately.
 - d. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
 4. Nonwelded Connections: Fabricate railing systems and handrails by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - a. Fabricate splice joints for field connection using epoxy structural adhesive where this represents manufacturer's standard splicing method.
 5. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard hand rail brackets, miscellaneous brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.

6. Provide inserts and other anchorage devices to connect handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
7. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, and steel plate forming bottom closure.
8. For removable railing posts, fabricate slip-fit sockets from steel tube whose inside diameter is sized for a close fit with posts and to limit deflection of post without lateral load, measured at top, to not more than 1/12 of post height. Provide socket covers designed and fabricated to resist being dislodged.
 - a. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
9. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
10. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.
11. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
12. Provide weep holes or another means to drain entrapped water in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.
13. Fabricate joints that will be exposed to weather in a watertight manner.
14. Close exposed ends of handrail and railing members with prefabricated end fittings.
15. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of the railing and wall is 1/4 inch or less.
16. Toe Boards: Where indicated, provide toe boards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.
17. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thickness. Size fillers to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

2.5 FABRICATION, AESS

- A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.
 1. Use special care handling and fabricating AESS before and after shop painting to minimize damage to shop finish.
- B. Architecturally Exposed Structural Steel, Category AESS 4:
 1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
 2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
 3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
 4. Make intermittent welds appear continuous, using filler or additional welding.
 5. Seal weld open ends of hollow structural sections with 3/8-inch (9.5-mm) closure plates.
 6. Limit butt and plug weld projections to 1/16 inch (1.6 mm).
 7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
 8. Remove weld spatter, slivers, and similar surface discontinuities.

9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
10. Grind tack welds smooth unless incorporated into final welds.
11. Remove backing and runoff tabs, and grind welds smooth.
12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.
13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303.
14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M.
15. Conceal fabrication and erection markings from view in the completed structure.
16. Make welds uniform and smooth.
17. Cut out mill marks from mill material or hide these markings from view in the completed structure. Where neither method is possible, remove mill marks by grinding and filling surfaces as approved by Architect.
18. Grind butt and plug welds smooth or fill, removing weld splatter exposed to view.
19. Orient HSS seams as indicated or away from view.
20. Align and match abutting member cross sections.
21. At visible open joints of copes, miters, and cuts, maintain uniform clear gaps of 1/8 inch (3.2 mm). At closed joints, maintain uniform contact within 1/16 inch (1.6 mm).
22. Fabricate with exposed surfaces smooth, square, and of surface quality approved by Architect.
23. Treat HSS seams to appear seamless.
24. Contour and blend welds and weld transitions between members, removing splatter exposed to view.
25. Fill surface imperfections with filler and sand smooth to achieve surface quality approved by Architect.
26. Minimize weld show-through and distortion on the opposite side of exposed connections by grinding to a smooth profile aligned with adjacent material.

2.6 FINISHES

A. Shop Cleaning:

1. Clean all surfaces of steel. Remove all rust, mill scale, deposits of splatter, slag or flux, oil, dirt, and all other materials.
 - a. Use hand tool, power tool, sandblasting, chemical cleaning, and any other method necessary to provide a smooth, sound surface.
2. Clean contact surfaces of high strength bolt of all burrs and material, which might prevent solid seating of the parts. Steel to receive bolts shall be primer painted except beneath the contact area of slip-critical bolts.

B. Shop Priming:

1. General:
 - a. "Painting of structural steel shall comply with the requirements contained in AISC 360. Painting of open-web steel joist girders shall comply with the requirements of SJI CJ-1.0, SJI JG-1.1, SJI K-1.1 and SJI LH/DLH-1.1. Individual structural members and assembled panels of cold-formed steel construction shall be protected against corrosion in accordance with the requirements contained in AISI S100. Protection of cold-formed steel light-frame construction shall also comply with the requirements contained in AISI S200," per CBC Section 2203A.1.
 - b. Shop prime all steel except the following:
 - 1) Surfaces embedded in concrete, or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2) Contact surfaces for slip-critical (sc) high strength bolts.
 - 3) Surfaces within 2 inches of field welds.

- 4) Top of structural support members when metal deck is welded to supports.
 - a) Primer is required when metal deck is mechanically attached to structural support members.
 - 5) Surfaces to receive sprayed-fire-resistive materials (applied fireproofing).
 - 6) Surfaces to be galvanized.
2. Priming:
- a. Immediately after surface preparation, apply primer according to manufacturer's written instructions and at a rate recommended by SSPC to provide minimum film thickness. Use priming methods that results in full coverage of joints, corners, edges and exposed surfaces.
 - 1) Strip paint corners, crevices, bolts, welds and sharp edges.
 - 2) Apply two shop prime coats to areas, which will be inaccessible after assembly or erection.
 - b. Provide PPG PAINTS field primers; or approved equivalent. Should the Contractor substitute another paint company other than "PPG PAINTS" in Specification Section - PAINTING, then coordination of steel primers with finish coats specified in Specification Section - PAINTING is the Contractor's responsibility.
 - c. Use the following shop painting systems on all normal environment interior steelwork:
 - 1) Surface Preparation: SSPC-SP2 "Hand Tool Cleaning" or SSPC-SP3 "Power Tool Cleaning."
 - 2) Application: Follow coating manufacturer's printed directions.
 - 3) Material: PPG PAINTS MULTI-PRIME 94-258 Primer.
 - 4) Number of Coats: One.
 - 5) Dry Film Thickness: 2.0 mils minimum.
 - 6) Volume Solids: 51.0 +/- 1.0% minimum.
 - 7) Generic Description: Modified Alkyd Resin Universal Primer.
 - d. Use the following shop painting systems on all exterior steelwork and interior steelwork subjected to wet conditions or fumes.
 - 1) Surface Preparation: SSPC-SP6 "Commercial Blast Cleaning."
 - 2) Application: Follow coating manufacturer's printed directions.
 - 3) Material: PPG PAINTS AMERCOAT 68HS Primer.
 - 4) Number of Coats: One.
 - 5) Dry Film Thickness: 5.0 mils minimum.
 - 6) Volume Solids: 78% +/-2%
 - 7) Generic Description: Reinforced Inorganic Zinc-Rich Urethane.
- C. Hot-Dip Galvanizing:
1. Zinc coatings on iron and steel products in accordance with ASTM A 123 "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products."
 - a. Minimum thickness required shall be 3.9 mils.
 2. Galvanize all items outside of the building envelope including, but not limited to structural steel columns and beams, railing systems, awnings, canopies, shade structures,

etc., per ASTM A 385, "Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)."

3. Zinc coatings on iron and steel hardware shall be in accordance with ASTM A 153 "Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware."
4. Galvanized repair paint: High-Zinc-Dust-Content, in accordance with SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight paint for re-galvanizing welds and repair painting galvanized steel.

D. Stainless Steel Finishes:

1. Remove tool and die marks and stretch lines or blend into finish.
2. Grind and polish to produce uniform, directionally textured, polished surfaces without cross-scratches. Run grain with long dimension of each piece.
3. Bright Directional Satin Finish No.4, unless otherwise shown on drawings.
4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.7 SOURCE QUALITY CONTROL

A. Tests, Inspection:

1. In accordance with Specification Section – TESTING LABORATORY SERVICES and the following:
 - a. Materials shall be certified, identified and tested in conformance with CBC Table 1705A.2.1. Commercial stock steel shall be identified in accordance with CBC Table 1705A.2.1.
 - b. Complete four-sided inspection of all steel shall be made when required by Architect.
 - c. Tests and inspection of Shop and field welding in accordance with CBC Table 1705A.2.1. Perform shop and field welding only under supervision of welding inspector.
 - 1) Welds shall be in accordance with CBC Table 1705A.2.1.
 - 2) Inspection:
 - a) Welding inspector shall be an AWS Certified Welding Inspector (CWI).
 - d. Tests & Inspection for High Strength Bolts in accordance with CBC Table 1705A.2.1.
2. Testing Laboratory:
 - a. An inspection and testing laboratory will be selected by the Owner for testing and inspection as required by the Contract Documents. The selected laboratory shall conform to the requirements of ASTM E 329 "Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction." Documentary evidence of such conformance shall be submitted to the Owner and the Governing Agency.
 - b. All materials, work, methods and equipment shall be subject to inspection at the mill, fabricating plant and at the building site. Material or workmanship not complying fully with the Contract Documents will not be accepted. The Contractor shall give the Testing Laboratory reasonable notice when ready for inspection and shall supply samples and test pieces and all facilities for inspection without extra charge. The Owner will assume the expense of making the tests and inspection except as otherwise specified in Division 1.
3. Cost of Testing and Inspection: Costs of testing and inspection of structural steel, except as specified hereunder and in Division 1, will be paid for by the Owner.
 - a. All transportation costs and per diem living costs for inspection at fabricator's plant further than 75 miles from the job site will be back-charged to the Contractor.
 - b. It is assumed that all fabrication will take place in one shop location only. All additional inspection costs will be back-charged to the Contractor.

- c. All mill tests and costs or re-test of plain materials shall be at the expense of the Contractor.
- d. Costs of tests required due to Contractor's failure to provide steel identifiable in accordance with the indicated ASTM designation shall be at the expense of the Contractor.
- 4. Structural Steel Testing and Inspection:
 - a. If structural steel tests are indicated as required on the structural drawings, one tension and one bend test shall be made for each size of structural shape, plate and for each tube and pipe size. Tests to be made in accordance with requirements of appropriate ASTM designations.
 - b. If structural steel tests are not indicated as required on the structural drawings, then for shapes, plates, bars, pipe and tubing, manufacturer's certified mill test reports and analysis for each heat will be acceptable for steel identifiable in accordance with indicated ASTM designation. Mill test reports shall indicate the physical and chemical properties of all structural steel used. Correlate individual heat numbers with each specified structural section.
 - c. Unidentifiable Steel:
 - 1) For F_y less than or equal to 36.0 ksi: Provide one tension and elongation test and one bend for each 5 tons or fraction thereof for each size.
 - 2) For F_y greater than 36.0 ksi: Provide one tension and elongation test and one bend or flattening for each piece.
 - d. Costs of re-tests and additional testing required by the use of unidentifiable steels shall be the Contractor's responsibility. Additional costs of testing incurred by the Owner shall be deducted from the Contract Final Payment.
- 5. Expansion Anchors: Load test as indicated on the drawings.
- 6. Welding Inspection:
 - a. If shop or field welding inspection is indicated on the structural drawings, all shop and field welded operations shall be inspected by a qualified welding inspector employed by the Testing Laboratory. Such Inspector shall be a person trained and thoroughly experienced in inspection of welds. The inspector's ability to distinguish between sound and unsound welding will be reliably established.
 - b. The Welding Inspector shall make a systematic record of all welds. This record shall include:
 - 1) Identification marks of welders.
 - 2) List of defective welds.
 - 3) Manner of correction of defects.
 - c. The welding inspector shall check the material, equipment and procedure, as well as the welds. He/she shall also check the ability of the welder. He/she shall furnish the Architect with a report, duly verified by him/her that the welding which is required to be inspected is proper, and has been done in conformity with the Contract Documents, and that he/she has used all means to determine the quality of the welds.
 - d. All full penetration groove welds shall be subject to ultrasonic testing, as per AWS D1.1, Clause 6 "Inspection, Part "C", Ultrasonic Testing of Groove Welds." All defective welds shall be repaired and re-tested with ultrasonic equipment at the Contractor's expense.
 - e. Column Flanges: An area extending 6 inches above and below point where girder flanges area attached shall be inspected. Column flange edges shall be inspected visually, and entire area ultrasonically for lamination, plate discontinuities, and non-metallic inclusions.
 - f. All partial penetration groove welds shall be tested by ultrasonic testing.
 - g. When ultrasonic indications arising from the weld root be interpreted as a defect, the Engineer shall be notified. The Engineer may require the removal of backing

strip. The backing strip shall be removed at the expense of the Contractor, and if no root defects are visible the weld shall be re-tested. If no defect is indicated on this re-test, and no significant amount of base and weld metal have been removed, no further repair of welding is necessary. If a defect is indicated, it shall be repaired and re-tested at the Contractor's expense.

- h. The ultrasonic instrumentation will be calibrated by the technician to evaluate the quality of the welds in accordance with AWS D1.1.
 - i. Other methods of inspection, for example, X-ray, gamma ray, magnetic particle, or dye penetrant, may be used on welds if felt necessary by the inspection laboratory, and with the approval of the Engineer.
 - j. Base metal thicker than 1-1/2 inches, when subjected to through thickness weld shrinkage strains, shall be ultrasonically inspected for discontinuities directly behind such weld before and after joint completion.
 - k. End-welded studs shall be sampled, tested, and inspected per the requirements of the Structural Welding Code – Steel D1.1, published by the American Welding Society.
 - l. At the discretion of the Owner's testing agency, the ultrasonic testing frequency may be reduced but may not be less than the following:
 - 1) Initially, all welds requiring ultrasonic testing will be tested at the rate of 100 percent in order to establish the qualifications of each individual welder. If the reject rate is demonstrated to be less than 5 percent of the welds tested for each welder, then the frequency of testing for that welder may be reduced to 25 percent. If the reject rate increases to 5 percent or more, 100 percent testing will be re-established until the rate is reduced to less than 5 percent. The percentage of rejects will be calculated for each welder independently.
 - m. A sampling of at least 40 completed welds will be made for such reduction evaluation. Reject rate is defined as the number of welds containing rejected defects divided by the number of welds completed. For evaluating the reject rate of continuous welds over 3' in length, each 12 linear inch increment of welds, 1 inch or less in thickness, will be considered as one weld. For evaluating the reject rate of continuous welds greater than 1 inch thickness, each 6 linear inches will be considered one weld.
7. High Strength Bolting Tests and Inspection:
- a. Furnish certified test reports for each lot of bolts which are tested in accordance with ASTM F 3125 "Standard Specification For High Strength Structural Bolts And Assemblies, Steel And Alloy Steel, Heat Treated, Inch Dimensions 120 Ksi And 150 Ksi Minimum Tensile Strength, And Metric Dimensions 830 MPa And 1040 MPa Minimum Tensile Strength." Install bolts under the supervision of a qualified bolting inspector in accordance with, Research Council "Specifications for Structural Joints Using High-Strength Bolts" and AISC 341-16 §J7.
 - b. While the work is in progress, the Inspector shall determine that the requirements of this Specification are met in the work. The Inspector shall observe the calibration procedures and shall monitor the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is properly used to tighten all bolts.
 - 1) In addition to the requirement of the foregoing paragraph, for all connections specified to be slip critical (SC), the Inspector shall assure that the specified procedure was followed to achieve the pretension specified in the AISC. The pre-tension shall be verified by the Inspector for these bolts.
 - 2) Bolts in connections identified as not being slip-critical nor subject to direct tension need not be inspected for bolt tension other than to ensure that the piles of the connected elements have been brought into snug contact.

B. Verification of Performance:

1. Testing Agent shall be a qualified person or Testing Laboratory listed and approved by [DSA/SSS][HCAI][AHJ] and selected by the Architect, and the Owner.
2. Testing Agent shall make Test and Inspection Reports certifying materials and workmanship to conform with Drawings and Specifications.
 - a. Cost of Testing and Inspection will be paid by Owner unless otherwise specified.
 - b. Cost of cutting and machining test samples shall be paid by Contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Employ a licensed land surveyor for accurate erection of structural steel.
 1. Check elevations of bearing surfaces (concrete or masonry), and locations of anchor bolts and similar devices, before erection work proceeds.
 2. Report discrepancies to Architect.
 3. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with the Architect.
- B. Erect all Structural Steel frame work in accordance with AISC Specifications "Specification for the Design, Fabrication and Erection of Structural Steel for Building," latest edition, and AISC Code unless otherwise indicated on Drawings or Specification.
 1. Framing: Carry up framing true and plumb. Provide temporary bracing wherever necessary to support all loads to which the structure may be subjected, including erection equipment and its operation. Leave bracing in place as long as may be required for safety. As erection progresses securely connect the work to take care of all dead load, wind and erection stresses.
 2. Connections:
 - a. Machine Bolts shall be installed with cut washer under nut.
 - b. High Strength Bolts shall be used to assemble structural joints in accordance with AISC "Specification for Structural Joints using bolts for ASTM F 3125 "Standard Specification For High Strength Structural Bolts And Assemblies, Steel And Alloy Steel, Heat Treated, Inch Dimensions 120 Ksi And 150 Ksi Minimum Tensile Strength, And Metric Dimensions 830 MPa And 1040 MPa Minimum Tensile Strength," unless otherwise indicated on the drawings.
 - 1) Tighten nuts for Bolts in accordance with CBC Sections 1705A.2.1. Load Indicating Devices shall be pre-approved by the [DSA/SSS][HCAI][AHJ], and certification by an independent testing laboratory stating that the

devices meet AISC Specifications shall be submitted to Project Engineer and [DSA/SSS][HCAI][AHJ].

- 2) Manufacturer shall also submit installation procedures prior to incorporation into the work for approval by the Project Engineer.
- 3) Once approved, manufacturer's installation instructions shall be followed for all conditions. Mark bolts that have been completely tightened with an identifying symbol.
- 4) Connections shall be slip-critical (SC) type, unless indicated otherwise on the drawings.
 - a) Slip-critical connections, surfaces shall be in accordance with ASTM F 3125 "Standard Specification For High Strength Structural Bolts And Assemblies, Steel And Alloy Steel, Heat Treated, Inch Dimensions 120 Ksi And 150 Ksi Minimum Tensile Strength, And Metric Dimensions 830 MPa And 1040 MPa Minimum Tensile Strength."
- 5) Contacting surfaces shall be painted, except for friction-type (SC) connections.
- 6) Provide washers in accordance with ASTM F 3125 "Standard Specification For High Strength Structural Bolts And Assemblies, Steel And Alloy Steel, Heat Treated, Inch Dimensions 120 Ksi And 150 Ksi Minimum Tensile Strength, And Metric Dimensions 830 MPa And 1040 MPa Minimum Tensile Strength."
- c. Welding: The details of all joints, the technique of welding employed, the appearance and quality of welds made, and the methods used in correcting defective work shall conform to "AISC Specs," "AWS Code," Table 1705A.2.1.
 - 1) All "exposed-to-view" welds will be smooth and flush with no voids showing and still be in conformance with standards referenced herein.
 - 2) All exposed to view butt welds shall be flush as connected members will allow. Minor defects and transitions in metal surfaces shall be filled and sanded out with an approved metal filler prior to painting.
 - 3) Exposed fillet welds are acceptable "as is" provided the surface chevrons are shallow and have no abrupt protrusions.
3. Cutting Holes: The use of a cutting torch is permissible only if the metal being cut is not carrying stress during the operation and only with the prior approval of the Architect and [DSA/SSS][HCAI][AHJ] for each specific condition.
4. Setting Plates: Set column base plates and leveling plates to correct elevations and temporarily support on steel wedges or shims until the supported members have been plumbed, locked in place and grouted.
- C. Erection Sequence: Erect steel in accordance with special erection sequences where special erection sequences are indicated on the contract documents.
- D. Before and during erection, keep all structural steel clean. Ship, handle and store steel in a manner to avoid injury to members. Steel members showing evidence to rough handling or injury will be rejected.
- E. Mark each member with erection identification corresponding to mark shown on erection drawings. Carefully plan erection of structural steel so that no cutting and removal of material will be necessary. Do not torch burn in the field, unless specifically permitted by Engineer.
- F. Provide sufficient bracing, shoring and guys to effect safe and satisfactory erection. Provide bracing and shoring capable of holding steel work plumb and properly aligned while field connections are being made, and until lateral force resisting elements are deemed by the Architect to be capable of bracing structure. Temporary bracing shall be adequate to resist lateral forces from wind or seismic prior to the completion of the lateral resisting system.

- G. Set bearing and base plates with extreme care. Bring level, to line and grade with leveling plates or by leveling nuts and bolts. Grout solid under plates with a flowable non-shrink grout per Specification Section – CAST-IN-PLACE CONCRETE prior to applying vertical load.
- H. Field Assembly: Set structural framing accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces which will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Shimming or other adjustments not indicated on drawings shall be approved by the Engineer prior to installation. Level and plumb individual members of the structure within specified AISC tolerances except as noted herein. Column shimming shall be 1/4 inch.
- I. All welds shall be full and clean, and conform to AISC and AWS Specifications.
- J. Erection Tolerances: Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 1. Individual pieces shall be erected so that the deviation from plumb, level and alignment shall not exceed 1 to 500 plus:
 - 2. The maximum displacement of the centerline of columns adjacent to elevator shafts, from the established column line, shall not be more than 1 inch at any point from the established column line in the first 20 stories.
 - 3. In order to provide a true, flat plane for the exterior elevations, install all steel framing at the exterior walls of the building, so that the center lines of such framing does not vary by more than 1 inch for the length of the building.
 - a. Also, install each vertical member on such grids so that its vertical centerline does not vary by more than 1/2 inch from a vertical line for each story and 1 inch for its full height.
 - 4. Take special care that column base plates are parallel and perpendicular to faces of columns and that bolt holes are accurately placed.
- K. Hoisting And Bracing:
 - 1. Provide all hoisting and erecting equipment and power.
 - 2. Provide and maintain any and all safety railings, toe boards, etc., required for the erection of steel framing and metal decking.
 - 3. Brace the erected frame in a manner which will assure safety and proper alignment to receive the metal decking and until the concrete slabs have been poured and have set.
 - 4. Erect building frame true and level. Erect columns in a manner to allow for movement due to welding shrinkage and thermal expansion and contraction of framing. Check for plumb after erection of each level. Maintain structural stability of frame during erection. Provide temporary bracing where necessary to maintain frame stability and to support required loads, including equipment and its operation.

3.4 ERECTION OF AECS

- A. Take special care during erection to avoid marking or distorting the AECS and to minimize damage to shop painting. Set AECS accurately in locations and to elevations indicated and according to ANSI/AISC 303 and ANSI/AISC 360.
 - 1. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Take care to avoid any blemishes, holes, or unsightly surfaces resulting from the use or removal of temporary elements.
 - 2. Grind tack welds smooth.
 - 3. Remove backing and runoff tabs, and grind welds smooth.
 - 4. Orient bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
 - 5. Remove erection bolts in Category AECS 4 AECS, fill holes with weld metal or filler, and grind or sand smooth to achieve surface quality approved by Architect.

6. Fill weld access holes in Category AESS 4 AESS with weld metal or filler and grind, or sand smooth to achieve surface quality as approved by Architect.
7. Conceal fabrication and erection markings from view in the completed structure.

Retain paragraph below if additional requirements, identified in SEAC/RMSCA's "Sample Specification, Section 050213: Architecturally Exposed Structural Steel," apply to the erection of AESS. In addition to ANSI/AISC 303, Section 10 requirements, comply with the following.

1. Erection of Category AESS 4:

Subparagraphs below repeat erection requirements identified by SEAC/RMSCA for Category AESS 1, Category AESS 2, and Category AESS 3 followed by Category AESS 4 erection requirements. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.

- b. Comply with AWS D1.1/D1.1M. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
- c. Remove weld spatter, slivers, and similar surface discontinuities.
- d. Grind off butt and plug weld projections larger than 1/16 inch (1.6 mm).
- e. Continuous welds are to be of uniform size and profile.
- f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
- g. Splice members only where indicated on Drawings.
- h. No torch cutting or field fabrication is permitted.
- i. Weld profiles, quality, and finish are to be as approved by Architect.
- j. Make joint welds, including tack welds, appear continuous by filling intermittent welds.
- k. Grind welds smooth.
- l. Minimize weld show-through and distortion on the opposite side of exposed connections by grinding to a smooth profile aligned with adjacent material.
- m. Oversize welds where ground, contoured, or blended, and grind to provide a smooth transition, matching profile approved by Architect.

3.5 REPAIR / RESTORATION

- A. Defective Work shall be immediately replaced with proper work. Such replaced Work and the Testing and Inspection for it shall be at the expense of the Contractor. If defects or damages cannot be corrected in the field, the material shall be returned to the shop or new parts furnished, as the Architect directs, and the Contractor shall pay all costs therefor.
 1. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780 "Practice for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings."
 2. Primer Coat - On all hot-dip iron or steel that needs repair, provide one primer coat of the following:
 - a. Zinc Rich Galvanize No. 1141 by AERVOE INDUSTRIES, INC., or approved equivalent.
 - b. Provide a smooth-flowing, high-solids compound that provides a fast-drying coating that protects ferrous metals in highly corrosive environments. Coating shall be 97% pure zinc metallic flake, which leaves 94% zinc in the dry film.
 - c. Overall Dry Film Thickness: 2.0 mil.
 3. Finish Coat - On all hot-dip iron or steel that needs repair, provide one finish coat over a properly cured primer coat of the following:
 - a. Zinc Rich Galvanize No. 1141 by AERVOE INDUSTRIES, INC., or approved equivalent.
 - b. Provide a smooth-flowing, high-solids compound that provides a fast-drying coating that protects ferrous metals in highly corrosive environments. Coating shall be 97% pure zinc metallic flake, which leaves 94% zinc in the dry film.

- c. Overall Dry Film Thickness: 2.0 mil.
- B. Touch-up Primer Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop priming to comply with SSPC-PA1 "Touching Up Shop-Painted Surfaces."
 - 1. Clean and prepare surfaces by SSPC-SP 2 "Hand-Tool Cleaning" or SSPC-SP 3 "Power-Tool Cleaning."

3.6 FIELD QUALITY CONTROL

- A. Site Tests:
 - 1. As required by Regulatory Requirements.
- B. Tests, inspection:
 - 1. As required by Regulatory Requirements.
 - 2. Schedule inspections and notify the Architect, Project Inspector and any other regulatory agencies of the time at least 48 hours prior to the inspection.
 - 3. No work shall be without the inspections required by Regulatory Requirements.
 - 4. Tests and inspection of field welding in accordance with CBC Table 1705A.2.1. Perform field welding only under supervision of welding inspector.
 - a. Welds shall be in accordance with CBC Table 1705A.2.1.
 - b. Inspection shall be in accordance with CBC Table 1705A.2.1.
 - 1) Welding inspector shall be an AWS Certified Welding Inspector (CWI).
- C. Verification of Performance:
 - 1. Certification:
 - a. The Contractor shall engage and pay for a registered Civil Engineer or Licensed Land Surveyor to check the alignment, plumbness, elevation, and overall accuracy of the erected framing at appropriate stages during construction and at completion of erection.
 - b. Civil Engineer or Licensed Land Surveyor shall submit written verification and certification that the entire installation is in accordance with the Contract Documents.

3.7 SCHEDULES

- A. Metal Fabrication Schedule should be used as a guide only and is not considered as a complete list. Refer to Drawings for location and details:
 - 1. Miscellaneous backing members, brackets, and supports for work installed by other trades.
 - 2. Countertop Bracket
 - 3. Fence
 - 4. Gates and Frames
 - 5. Ladder
 - 6. Lintels
 - 7. Sunscreen
 - 8. Removable Bollard
 - 9. Guard Rail
 - 10. Hand Rail
 - 11. Handrail Bracket
 - 12. Stair Rail
 - 13. Queuing Rail
 - 14. Stairs
 - 15. Fixed Bollard
 - 16. Canopy
 - 17. Down Spouts

END OF SECTION

STEEL AND FABRICATIONS

2310

SECTION 061000 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to complete all rough carpentry, accessories and other related items necessary to complete the Project as indicated by the Construction Documents unless specifically excluded.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 11 01 CONCRETE FORMWORK
 - 4. 03 15 14 DRILLED ANCHORS
 - 5. 03 30 00 CAST-IN-PLACE CONCRETE
 - 6. 05 12 00 STEEL AND FABRICATIONS
 - 7. 06 41 23 MODULAR CASEWORK
 - 8. 07 21 00 INSULATION
 - 9. 07 60 00 SHEET METAL
 - 10. 07 72 00 ROOF ACCESSORIES
 - 11. 07 92 00 SEALANTS
 - 12. 08 11 00 METAL DOORS AND FRAMES
 - 13. 08 31 13 ACCESS DOORS AND FRAMES
 - 14. 08 70 00 HARDWARE
 - 15. 09 22 00 METAL FRAMING
 - 16. 09 29 00 GYPSUM BOARD
 - 17. 09 30 00 TILE
 - 18. 09 50 00 ACOUSTICAL CEILINGS
 - 19. 09 65 10 RESILIENT BASE AND ACCESSORIES
 - 20. 09 68 40 CARPET
 - 21. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 22. 10 14 00 IDENTIFYING DEVICES
 - 23. 10 44 00 FIRE PROTECTION SPECIALTIES
 - 24. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. ALSC American Lumber Standards Committee
 - b. ANSI American National Standards Institute
 - c. APA The Engineered Wood Association (Formerly the American Plywood Association)
 - d. ASME American Society of Mechanical Engineers International
 - e. AWWA American Wood Protection Association
 - f. CABO Council of American Building Officials
 - g. FS Federal Specification
 - h. ICC International Code Council
 - i. NDS National Design Specification for Wood Construction
 - j. NIST National Institute of Standards and Technology
 - k. PS Product Standards of the U.S. Department of Commerce
 - l. RIS Redwood Inspection Service

- m. WCLIB West Coast Lumber Inspection Bureau
- n. WWPA Western Wood Products Association

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data:
 - a. Submit manufacturer's data for Wood-Preservative Treatment.
 - b. Submit manufacturer's data for Fire-Retardant Treatment.
 - c. Submit manufacturer's data for power driven fasteners, metal-framing connectors, and metal framing anchors.
 - 2. Quality Assurance/Control Submittals:
 - a. Material Certificates: Submit Material Certificates of Compliance to Standards and Regulatory Requirements.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
- B. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CARB 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), in the area where the project is located.
- C. Meetings:
 - 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 - 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintaining installed work until the Notice of Substantial Completion has been executed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver undamaged products to project site in manufacturer's sealed containers or bundles with tags and labels intact.
- B. Storage and Protection:
 - 1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.
 - 2. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. Dust Control: Perform work in a manner as to minimize the spread of dust and flying particles.
2. Burning: No burning will be allowed on-site.
3. Rain: Work under this section shall not be started or maintained under threat of rain unless the work is not affected by the rain.

B. Existing Conditions:

1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.

1.7 WARRANTY

A. Contractor's General Warranty:

1. In accordance with Specification Section - WARRANTIES.

B. Manufacturer's Warranty:

1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.

C. Installer's Warranty:

1. In accordance with the terms of the Specification Section - WARRANTIES
 - a. Warranty Period One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.

1. Power Driven Fastener specified product manufacturer:
 - a. HILTI FASTENING SYSTEMS.
2. Metal Framing Anchor specified product manufacturer:
 - a. SIMPSON STRONG-TIE COMPANY.
 - b. Acceptable alternative manufacturers:
 - 1) Manufacturers of Alternative Metal Framing Anchors shall have Model Code Research Evaluation Reports and Published allowable design loads that are determined from empirical data, or by rational engineering analysis, that are demonstrated by comprehensive testing performed by a qualified testing agency acceptable by the Architect or its Designated Design Consultant, and DSA.
3. Metal Timber Framing Connector specified product manufacturer:
 - a. SIMPSON STRONG-TIE COMPANY.
 - b. Acceptable alternative manufacturers:
 - 1) Do not substitute connectors manufactured by others than SIMPSON STRONG-TIE COMPANY without prior written review by the Architect or its Designated Design Consultant, and DSA.

- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

A. Wood:

1. Douglas Fir - Larch:

- a. Standards and Requirements: In accordance with WCLIB "Standard Grading and Dressing Rules" No. 17, latest edition, and WWPA "Western Lumber Grading Rules," latest edition.
 - 1) All wood shall be "DRY" and having a moisture content of less than 19 percent at the time of installation, in accordance with WWPA.
 - 2) Provide wood of S4S unless otherwise noted.
 - 3) Factory mark each piece of wood with the grade stamp of the grading agency.
- b. Grading and Use Requirements:

Item	Sizes	Grade	Maximum Moisture Content at Initial Use (Installation)
Studs	2x	No. 1	19%
Studs	3x, 4x, 6x	No. 1	19%
Sills & Plates	2x	No. 1	19%
Sills & Plates	3x, 4x, 6x	No. 1	19%
Beams	4x, 6x	No. 1	19%
Joists	2x	No. 1	19%
Posts	4x, 6x, 8x	No. 1	19%
Ledgers	2x	No. 1	19%
Ledgers	3x, 4x, 6x	No. 1	19%
Blocking	2x, 3x, 4x, 6x	No. 1	19%
Sheathing and Stripping	Up to 1-1/2" thick 2" width and wider	No. 1	19%
Stripping	2x, 3x, 4x, 6x	Construction	19%
Nailers & Grounds	2x, 3x, 4x, 6x	Construction	19%
Furring	2x, 3x, 4x, 6x	Construction	19%
T & G Decking	2x	Select Dex	15%

- 1) Initial use shall be that point at which screws or other fasteners or the holes for said fasteners are installed into the wood.
- 2) The Contractor shall use whatever means necessary, including site drying to ensure that the moisture contents listed above are not exceeded.

B. Plywood:

1. Soft Plywood:

- a. Standards and Requirements: In accordance with PS1-09, Group 1 Douglas-Fir and PS2-10.
 - 1) Factory mark each piece of plywood with the APA Grade Stamp.
 - 2) Maximum Moisture Content at Initial Use (Installation) shall be 15 percent.
- b. Grading and Use Requirements:
 - 1) Wall, Roof, and Parapet Sheathing:
 - a) APA Rated Sheathing - Structural 1.
 - b) Span Rating as required to suit stud or joist spacing.
 - c) Exposure Durability Classification - Exposure 1.
 - d) Species Group 1.
 - e) Grade C-C 3 ply for 1/4 inch thickness and C-D 5 ply for 1/2 and 5/8 inch thickness.

- 2) Subflooring, Floor Sheathing as underlayment, Equipment Platform Sheathing:
 - a) APA Rated "Sturdi-Floor."
 - b) Span Rating as required to suit joist spacing.
 - c) Exposure Durability Classification - Exposure 1.
 - d) Species Group 1.
 - e) Grade C-C plugged.
- 3) Backing panels for Electrical Equipment.
 - a) APA Rated Sheathing - Structural 2.
 - b) Exposure Durability Classification - Exterior.
 - c) Species Group 1.
 - d) Grade C-C.
 - e) Shall be 3/4 inch minimum thickness.
- 4) Backing panels for Telecommunication Equipment:
 - a) APA Rated Sheathing - Structural 2.
 - b) Exposure Durability Classification - Exterior.
 - c) Species Group 1.
 - d) Grade A-B.
 - e) Shall be 3/4 inch minimum thickness.

2.3 FINISHES

A. Preservative Treatment:

1. Pressure Treat Wood and Plywood, with CARB Complying, EPA Registered, preservatives in accordance with AWP Standards "U," "T," and "P."
 - a. Do not use material that does not comply with the requirements for untreated material.
 - b. After treatment, kiln-dry wood to a maximum moisture content of 19 percent.
 - c. After treatment, dry plywood to a maximum moisture content of 15 percent.
 - d. Factory mark each treated item with the treatment quality mark of an Independent Inspection Agency approved by the ALSC Treated Wood Program.
2. Non-pressure treat Wood and Plywood, with CARB Complying, EPA Registered preservatives in accordance with AWP Standards "U", "T", "P," □ and "N."

B. Fire Retardant Treatment:

1. Fire Retardant Treat Wood and Plywood with pressure treatment materials that comply with performance requirements of CBC 2303.2.
 - a. Use Exterior Type.
 - b. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures when tested by a qualified independent testing agency and is acceptable to Fire and Life Safety authorities.
 - c. Use treatment that does not promote corrosion of metal fasteners.
 - d. After treatment, kiln-dry wood to a maximum moisture content of 19 percent.
 - e. After treatment, dry plywood to a maximum moisture content of 15 percent.
 - f. Factory mark each treated item with the treatment quality mark of an Independent Inspection Agency.

2.4 ACCESSORIES

- ### A. Fasteners:
- All types shall comply with standards and dimensions of the latest edition of NDS. All types of fasteners exposed to wet or exterior conditions, in-ground contact, in pressure or preservative treated woods, in concrete or masonry, or in an area of high relative humidity shall be hot-dipped galvanized in accordance with ASTM A 153 "Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware."

1. Nails: Common wire nails or spikes complying with ASTM F 1667 "Specification for Driven Fasteners: Nails, Spikes, and Staples," and CBC Section 2304.10. Box nails and sinker nails are not permitted. Vinyl coating is permitted on common nails.
 2. Bolts: Steel bolts complying with ASTM A 307 "Specification for Carbon Steel Bolts and Standards, 60,000 PSI Tensile Strength," Grade A, hex head.
 - a. Provide hex head nuts complying with ASTM A 307 "Specification for Carbon Steel Bolts and Standards, 60,000 PSI Tensile Strength," and standard flat washers complying with ANSI/ASME B18.22.1, Type A, Wide pattern.
 3. Lag Bolts: Shall comply with ANSI/ASME B18.2.1, hex head.
 - a. Provide standard flat washers complying with ANSI/ASME B18.22.1, Type A, Wide pattern.
 4. Wood Screws: Shall comply with ANSI/ASME B18.6.1.
 - a. Screws for fastening wood to Metal Framing shall comply with ASTM C 954 "Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness."
 5. Power Driven Fasteners: Tempered Steel pins with corrosive resistant plating or coating complying with ICC ESR-1539.
- B. Metal Framing Anchors: All anchors shall comply with ASTM A 653 "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process," G60 Coating Designation for hot-dipped zinc-coated steel sheet. Provide structural, commercial, or lock-forming quality as standard with manufacturer for type of anchor indicated.
- C. Metal Timber Framing Connectors: All connectors shall have specific ICC Approval and be fabricated from hot-dipped galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual, which affect the execution of work under this specification section.
 2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 3. Execution of work under this specification section shall constitute acceptance of existing conditions.
 4. Verify that work under this Section may be performed in strict accordance with the original design and all pertinent codes and regulations.

3.2 PREPARATION

- A. Coordination:
1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
- B. Protection:
1. Protect all materials from damage occurring from work called for under this specification section.
- C. Preservative Treatment:
1. Members requiring pressure treatment:
 - a. Sills, Plates, Ledgers, Studs, Joists, Blocking, Nailers and Furring attached or resting on or against concrete or masonry construction.

- b. Pressure treated members cut in the field shall have the cut ends painted with preservative until the wood or plywood absorbs no more preservative.
- 2. Members requiring field treatment:
 - a. All wood and plywood members at exterior walls within two feet of the ground surface.
 - b. Treat all surfaces of the member.
 - c. Treat by dipping the required portion of the member into preservative for 15 minutes or paint until the wood or plywood absorbs no more preservative. Wait a minimum of two hours after dipping or painting is complete to incorporate member into project.
 - d. Test treat items for compatibility where additional finish coats (stain or paint) may occur.
- D. Fire Retardant Treatment:
 - 1. All wood and plywood members as indicated.
 - 2. All plywood panels for Telecommunication Equipment.

3.3 INSTALLATION

- A. General:
 - 1. In accordance with manufacturer's instructions and recommendations unless specifically noted otherwise.
 - 2. In accordance with approved submittals.
 - 3. In accordance with Regulatory Requirements.
 - 4. Selection of wood and plywood pieces:
 - a. Carefully select all members.
 - b. Select individual pieces so that knots and obvious defects will not interfere with placing bolts, proper nailing, and making proper connections.
 - c. Cut out and discard all defects which will render a piece unable to serve its intended function.
 - d. Wood and plywood may be rejected by the Architect or its Designated Design Consultant, and DSA whether or not it has been installed for excessive warp, twist, bow, crook, mildew, fungus, or mold as well as for improper cutting, fitting and treatment when required.
 - 5. All wood and plywood shall be accurately cut to lengths required.
 - 6. All work shall produce joints true, tight, level, plumb, and all members are securely anchored.
 - a. Do not shim any framing member.
- B. Layout:
 - 1. Lines shall be straight and true.
- C. Fastening:
 - 1. Nails:
 - a. All nailing shall be as required by CBC Table 2304.10.2 "Fastening Schedule."
 - b. Machine nailing may be approved subject to the approval of the Architect or its Designated Design Consultant, and DSA.
 - 1) The use of machine nailing is subject to a satisfactory job site demonstration for each project. The approval is subject to continued satisfactory performance.
 - 2) In plywood, if the nail heads penetrate beyond flush with the surface of the sheathing, or if minimum allowable edge distances are not maintained, the performance will be deemed unsatisfactory.
 - 3) Machine nailing will not be accepted in 5/16" plywood.
 - c. Penetration of nails or spikes shall be one-half the length of the nail or spike into the piece receiving the point.
 - d. 16d nails shall be used to connect pieces 2" in thickness unless otherwise indicated.
 - e. Clinch nails protruding through members.

- f. Bore holes for nails where necessary to prevent splitting.
 - g. Use Finish or Casing Nails for finish work.
- 2. Lag Bolts:
 - a. Lag Bolts shall be screwed into place. No driving is allowed.
 - b. For the Shank portion, holes shall be bored the same depth and diameter as the shank. For threaded portion, holes shall be between 60% and 75% of the shank diameter.
 - c. Malleable Iron or Steel plate washers shall be used where bolt heads bear on wood or plywood. Washers shall have an area equal to 16 times the area of the bolt.
 - 1) Steel plate washers shall have a thickness not less than 1/10 the length of the washer's longest side.
 - 2) Malleable Iron washers shall have a bearing surface for the head equal in diameter to not less than the long diameter of the head.
 - d. Tighten all bolts and screws prior to concealing within structure.
- 3. Bolts:
 - a. Holes shall be 1/16" larger than bolt diameter.
 - b. Malleable Iron or Steel plate washers shall be used where bolt head and nuts bear on wood or plywood. Washers shall have an area equal to 16 times the area of the bolt.
 - 1) Steel plate washers shall have a thickness not less than 1/10 the length of the washer's longest side.
 - 2) Malleable Iron washers shall have a bearing surface for the head or nut equal in diameter to not less than the long diameter of the head or nut.
 - c. Tighten all bolts prior to concealing within structure.
- 4. Power Driven Anchors
 - a. Fastening shall be accomplished by low-velocity piston-driven power activated tool.
 - b. Pins shall have guide washers to accurately control penetration.
- 5. Expansion Anchors (Post-Installed Concrete Anchors):
 - a. Refer to Specification Section - DRILLED ANCHORS.
- 6. Metal Framing Anchors
 - a. Use half-length nails where required or indicated.
- 7. Metal Timber Framing Connectors
 - a. Nailing shall conform to manufacturer's instructions with a nail provided for each punched hole.
- D. Sills:
 - 1. Shall be in long lengths of sizes as indicated.
 - 2. Fasten with a minimum of two (2) anchor bolts per piece and bolt within 9", but not nearer than 6", from the end of piece.
 - 3. Malleable iron or steel plate washers shall be placed under anchor bolt nuts bearing on wood.
 - 4. Set Sill level and true.
- E. Studs and Posts:
 - a. Shall be full length.
- 2. Cut members to provide full bearing at ends.
- F. Plates:
 - 1. Shall be in long lengths and spliced as indicated.
- G. Joists and Beams:
 - 1. Shall be in long lengths and spliced over bearings unless otherwise indicated. Do not overcut.
 - 2. Install with crown side up.
 - 3. Beams or headers indicated to be built-up of two or more joists shall be constructed on the project site using full length members.
- H. Blocking:

1. Blocking shall be same thickness and width of studs or joists unless otherwise indicated.
 2. Install blocking at all wall, floor, or roof penetrations.
 - a. Blocking shall provide surface for fastening applied interior or exterior flashings or flanges.
 3. Install blocking at all plywood joints.
 - a. Install blocking at plywood edges including crickets and parapet wall bracing.
 4. Shall be provided for all fixtures, equipment, casework, toilet partitions, toilet accessories, handrails, visual display boards, identifying devices, finish hardware, flashing, wall and ceiling finishes, and other items as indicated. See also Specification Section - OWNER FURNISHED ITEMS for listing of N.I.C. items that will require blocking coordination.
 - a. Coordinate placement of blocking and supports with manufacturer or supplier of items.
 5. Fireblocking shall be provided to cut off all horizontal and vertical concealed draft openings in accordance with CBC Section 718.2.
 - a. Horizontal Fireblocking in walls shall be typically placed at 4'-0" above finished floor, at 8'-0" above finished floor, at mezzanine floor plane unless otherwise indicated, and at ceiling line plane.
 6. Bridging shall be installed in all joist members deeper than 8 inches unless otherwise indicated.
 - a. Bridging shall extend the full depth of the joists.
 - b. Drill bridging within attics to provide ventilation as indicated.
- I. Plywood Sheathing Panels:
1. For panels with different veneer face grades, the exposed face shall always be the higher grade.
 2. Space panels 1/8 inch at all edge and end joints, and in accordance with APA.
 3. Panels shall be applied with the long dimension (or strength axis) across the framing.
 4. Fasten from the field of the panel first and then to the ends and edges to reduce stressing of the panel surfaces.
 5. Center all joints over bearing supports.
 6. Wall panels shall continue uninterrupted by ceilings or soffits from floor to floor or roof unless otherwise indicated.
- J. Sheathing:
1. Shall be in accordance with the following:
 - a. Wall Sheathing: CBC Section 2304.6 and Table 2304.6.1.
 - b. Floor and Roof Sheathing: CBC Section 2304.8.
 - c. Structural Floor Sheathing: CBC Section 2304.8.1.
 - d. Structural Roof Sheathing: CBC Section 2304.8.2.
 - e. Lumber Decking: CBC Section 2304.9.
- K. Nailers and Grounds:
1. Shall be installed as indicated and where required for attaching other work.
 2. Form to shapes indicated.
 3. Coordinate locations with other work involved.
 4. Provide nailers at all flashing and edge terminations when required by roofing manufacturer for metal and concrete roof decks. When the roof system is required to be Class A use fire-retardant treated wood.
 5. Provide permanent Grounds of dressed, pressure-preservative-treated, Key-beveled wood and of thickness required to bring face of ground to exact finish thickness of finish material. Remove temporary grounds when no longer required.
- L. Furring and Stripping
1. Shall be installed as indicated and where required to provide fastening material or space for the passage of pipes, conduits, etc. not accommodated including ceiling stripping.
- M. Sealant:

1. When indicated, Primer shall be in accordance with sealant manufacturer recommendations.
2. When indicated, Joint Sealer shall be in accordance with Specification Section - SEALANTS.

3.4 CONSTRUCTION

- A. Draftstopping:
 1. Shall be provided in floor, attic, and ceiling areas in accordance with CBC Section 718.3 and 718.4.
- B. Pipes:
 1. Frame to avoid cutting or drilling for passage of pipes, ducts, and conduit.
 2. Follow criteria as indicated for cutting or drilling. Unusual edge distances and awkward spacing and sizes shall be brought to the Architects attention for remedy.
- C. Chimneys and Flues:
 1. Keep all framing 2 inches away from chimney or flues in accordance with CBC Section 2304.5.
- D. Cant Strips and Crickets:
 1. Shape to sizes indicated.
 2. Rigidly fasten to construction.
 3. Block all joints of plywood panel construction.
 4. Form neat and mitered corners.
- E. Temporary Enclosures:
 1. Provide and maintain all barricades and enclosures required to protect the work in progress.
- F. Shoring or Bracing:
 1. Shore or brace for temporary support of all work as required during the construction period except any shoring and bracing specified and included under other sections of this Project Manual.
- G. Wood Curbs for Equipment:
 1. Construct all wood curbs for roof mounted equipment.
 2. Provide all miscellaneous blocking, bracing, supports, and other wood items to complete the work.

3.5 FIELD QUALITY CONTROL

- A. Site Tests:
 1. As required by Regulatory Requirements.
 2. Project Inspector shall verify by means of a handheld moisture content meter that all wood and plywood supplied at the time of incorporation into structure(s) has met applicable moisture content requirements.
 3. Project Inspector shall test all stud cavity walls to ensure that studs are a maximum of 19 percent moisture content prior to any other construction that encloses the wall cavity.
- B. Inspection:
 1. As required by Regulatory Requirements.
 2. Schedule inspections and notify the Architect, Project Inspector and any other regulatory agencies of the time at least 48 hours prior to the inspection.
 3. No work shall be without the inspections required by Regulatory Requirements.

3.6 CLEANING

- A. Removal of Debris:
 1. Remove all Wood, including form lumber, chips, shavings and sawdust in or on the ground from the areas inside buildings. Do not bury debris in fill.

END OF SECTION

SECTION 064123 – MODULAR CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Provide all material, labor, equipment and services necessary to completely install all Modular Casework materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
 - a. Plastic laminate-faced casework.
 - b. Transparent wood finish casework.
 - c. Adjustable shelf supports: Metal Shelf Standards][Bored-Hole Shelf Rest Systems]
 - d. Plastic Laminate countertops.
 - e. Solid-Surface countertops.
 - f. Solid-stave wood (butcher block) countertops.
 - g. Solid-surface fabrications.
 - h. Plastic fabrications.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
1. DIVISION 00 SPECIFICATION SECTIONS.
 2. DIVISION 01 SPECIFICATION SECTIONS.
 3. 03 15 14 DRILLED ANCHORS
 4. 03 30 00 CAST-IN-PLACE CONCRETE
 5. 06 10 00 ROUGH CARPENTRY
 6. 07 60 00 SHEET METAL
 7. 08 70 00 HARDWARE
 8. 09 22 16 METAL FRAMING
 9. 09 29 00 GYPSUM BOARD
 10. 09 65 10 RESILIENT BASE AND ACCESSORIES
 11. 09 68 40 CARPET
 12. 09 72 00 WALL COVERINGS
 13. 09 91 00 PAINTING
 14. 10 05 00 MISCELLANEOUS SPECIALTIES
 15. 11 40 00 FOOD SERVICE EQUIPMENT
 16. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
1. In accordance with the following standards:
 - a. BHMA BHMA stands for Builders Hardware Manufacturers Associates, Inc.
 - b. NAAWS "North American Architectural Woodwork Standards," Latest Edition, including latest amendments, by the Architectural Woodwork Institute, Architectural Woodwork Manufacturers Association of Canada, and the Woodwork Institute.
 - c. NEMA National Electrical Manufacturers' Associates, Publication Number LD3, latest-edition
 - d. NIST National Institute of Standards and Technology
 - e. NWMA "Industrial Standard" National Woodwork Manufacturer's Association.
 - f. PS Product Standard of the U. S. Department of Commerce

1.3 DEFINITIONS

- A. Refer to NAAWS.
- B. Exposed Portions:
 - 1. Face members and edges of cabinets (cabinet fronts), such as face plates, drawer fronts, door fronts, front edge of shelves.
 - 2. Interior faces of cabinet doors.
 - 3. Underside of bottoms of upper cabinets, 48" above finished floor.
 - 4. Cabinet tops:
 - a. Under 72" above finish floor.
 - b. Visible from upper building level.
 - 5. Interior surfaces (including top, bottom, and front of shelves) of open cabinets or cabinets with glass doors.
 - 6. All surfaces of exposed shelves.
 - 7. All surfaces exposed to view.
- C. Semi-Exposed Portions:
 - 1. Cabinet divisions, shelves, insides of drawers, and any other cabinet members which cannot be seen when door or drawers are closed.
- D. Concealed Portions:
 - 1. Cabinet framing that cannot be seen, such as web frame members, sleepers, dust panels, toe strips covered with resilient base.
- E. Shelving:
 - 1. Top and bottom surfaces. Face surfaces are the front and rear edges.
 - a. Ends are the left/right edges as you face the cabinet.
 - 2. The bottom surface material of all Upper Cabinets attached to walls shall be considered a shelf and manufactured as a shelf.
- F. Quality Assurance Options:
 - 1. Certified Compliance Program (CCP):
 - a. The CCP is an established discipline of quality control, for use in conjunction with the NAAWS, which provides a non-biased means of confirming conformance to a project's drawings and specifications.
 - b. Contractor to provide field inspection by WI Director, additional to CCP requirements.
 - c. The Woodwork Manufacturer shall have no less than 5 years of production experience, similar to this project, whose qualifications indicate the ability to comply with the requirements of this Section.
 - d. The Woodwork Manufacturer must have at least one project in the past 5 years where the value of the woodwork was within 20 percent of the cost of woodwork for this Project.
 - 2. Monitored Compliance Program (MCP):
 - a. The MCP is an established discipline of quality control, for use in conjunction with the NAAWS, which provides a non-biased means of confirming conformance to a project's drawings and specifications,
 - b. Includes ongoing review/inspections of the project from its start to certification at completion.

- c. The Woodwork Manufacturer shall have no less than 5 years of production experience, similar to this project, whose qualifications indicate the ability to comply with the requirements of this Section.
- d. The Woodwork Manufacturer must have at least one project in the past 5 years where the value of the woodwork was within 20 percent of the cost of woodwork for this Project.

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements: It is the intention of this specification section and the drawings to form a guide for a complete and operable system. Any items not specifically noted but necessary for a complete and operable system shall be provided under this section.
 - 1. All shelving must be manufactured according to NAAWS for Schools, Hospitals and Library or Book Shelving. 50 lbs./SF.

1.5 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data.
 - a. Submit manufacturer's full color range (including any standard and premium colors) for selection by the Architect.
 - b. Submit 2 copies of Manufacturer's current specifications for Modular Casework including all types of cabinets and accessories included in this section to the Architect for approval prior to fabrication.
 - 2. Shop Drawings.
 - a. Submit shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, seam locations, components, and location and size of each field connection.
 - b. Shop Drawing format in accordance with NAAWS Section 1, Submittals and WI's Certified Compliance Program.
 - 1) The shop drawings for the modular casework shall comply with and bear the WI CERTIFIED COMPLIANCE LABEL.
 - 2) Each elevation of casework, each laminated plastic top, and each solid surface top shall bear a WI CERTIFIED COMPLIANCE LABEL.
 - 3) Indicate spacing of all hardware accessories for Architect's review of layout.
 - 4) On casework and countertop elevations show the location of backing required for attachment within walls.
 - 5) Before delivery to the jobsite the woodwork supplier shall provide a WI CERTIFIED COMPLIANCE CERTIFICATE indicating the millwork products being supplied and Certifying that these products fully meet the requirements of the Grade or Grades specified.
 - 6) At completion of installation the woodwork installer shall provide a WI CERTIFIED COMPLIANCE CERTIFICATE indicating the products installed, and Certifying that the installation of these products fully meets the requirements of the Grade or Grades specified.
 - 7) All fees charged by the Woodwork Institute for their Certified Compliance Program are the responsibility of the millwork manufacturer and/or installer and shall be included in their bid.
 - 3. Samples.
 - a. Provide nominal 2" x 3" sample chains of manufacturer's Transparent Wood Finishes to match existing cabinetry.

- 1) Coordinate with Specification Section -- PAINTING, and submit color samples of manufacturers full color range of transparent finishes for the wood species to match existing.
- b. Provide nominal 2" x 3" sample chains of manufacturer's non-premium and premium laminate color selection lines.
 - 1) Submit color samples of Manufacturer's full color and pattern range (including wood grains) of non-premium and premium priced High Pressure Decorative Laminate to the Architect for color selection prior to fabrication.
 - a) See drawings for high pressure decorative laminate color selection.
 - 2) Submit color samples of high density overlay thermal-fused melamine for color selection by the Architect.
 - a) Samples shall be equivalent to SELPLY products, from their full color range selection chain of colors.
 - 3) Provide finish color selection samples of Pilaster Standard. Specified colors subject to change.
- c. Mock-up as described elsewhere in this section.
4. Quality Assurance/Control Submittals:
 - a. Certificates:
 - 1) Submit three (3) copies of the following:
 - a) Before delivery to the jobsite, the modular cabinetwork supplier shall issue a WI CERTIFIED COMPLIANCE CERTIFICATE indicating the modular cabinetwork products and/or fabrication of products to be furnished for this project shall meet fully all the requirements of the grade or grades specified.
 - b) Upon completion of inspection of installation by WI Inspector, a WI CERTIFIED COMPLIANCE CERTIFICATE shall be furnished for the installation.
 - 2) Submit three (3) copies of a letter on Contractor's Letterhead certifying work provided, meets or exceeds, the requirements of this Section.
 - b. Labels:
 - 1) Each plastic laminate countertop supplied shall bear the WI CERTIFIED COMPLIANCE LABEL.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Material Qualifications:
 - a. Grades as indicated on the drawings in accordance with the specifications, rules and details or casework of the NAAWS Sections 5 "Finishing," 10 "Casework," and 11 "Countertops," unless the drawings and these specifications modify said standards.
 - 1) See Appendix "A" for "Cabinet Design Series" (CDS) Number System used on Modular Casework Schedule.
 - b. Laminated Plastic Countertops, Splashes, and Wall Paneling in accordance with NAAWS Section 11 "Countertops."
2. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
3. Manufacturer/Supplier Qualifications:
 - a. Firm(s) experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.

- b. All modular Cabinet Work must be done by a Single Source WI licensed manufacturer and be able to provide a WI Certified Compliance Certificate.
 - c. Participation in Woodwork Institute Quality Assurance Program:
 - 1) If supplier is WI Member Licensee in good standing:
 - a) Comply with WI CERTIFIED COMPLIANCE PROGRAM (CCP).
 - b) Provide WI Director to inspect installation on-site.
 - 2) If supplier is not WI Member Licensee in good standing:
 - a) Comply with WI MONITORED COMPLIANCE PROGRAM (MCP).
- B. Regulatory Requirements:
- 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CBC All hardware for casework shall meet CBC Section 11B-309.4 and 11B-811.4.
 - b. California ARB ATCM California Air Resource Board's Air Toxics Control Measure for Composite Wood, 17 CCR 93120
- C. Mockups:
- 1. Prior to fabricating or installing Modular Cabinet Work, construct a mockup to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Provide one lower cabinet with drawer, and one upper cabinet, with all examples of hardware for both lower and upper cabinets.
 - 2. Provide mock-up of exposed and interior cabinet surfaces with Pilaster Shelf Standard for review and comment prior to fabrication. Color selection of Pilaster may be subject to change.
- D. Meetings:
- 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with all other related work
 - b. identify potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - c. Review the locations of backing required for casework installation as shown on the casework shop drawings and the Contract Documents.
 - d. Review the method of attachment of the backing to the wall system as shown on the Contract Documents.
 - 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 - 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. WI Inspector, Project Inspector, and the Architect shall inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading:
- 1. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.
- B. Acceptance at Site:

1. Hardware products (not already applied) must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
2. Casework products must be free from scratches, gouges, or any other marring or discoloration.
3. Damaged products will not be accepted.

C. Storage and Protection:

1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units, in compliance with PROJECT CONDITIONS below.
 - a. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.

1.8 PROJECT CONDITIONS

A. Environmental Requirements:

1. Humidity and Temperature: Maintain humidity and temperature in the space to receive products between 45 percent to 65 percent at a temperature of 60 degrees to 90 degrees F. Equilibrium Moisture Content of the wood product conditions shall be maintained between 8 percent and 12 percent. Maintain these requirements for four (4) days minimum prior, during, and following installation in accordance with manufacturer's written recommendations. Inform the Owner of humidity requirements for products installed and maintain until Substantial Completion and the turn-over of the building or facility to the Owner.

1.9 WARRANTY

A. Contractor's General Warranty:

1. In accordance with Specification Section - WARRANTIES.

B. Manufacturer's Warranty:

1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.

C. Installer's Warranty:

1. In accordance with the terms of the Specification Section - WARRANTIES
 - a. Warranty Period One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.

1. Specified product manufacturers:
 - a. High Pressure Decorative Laminate: WILSONART.

- ## 2.2 CABINET MATERIALS

1. General:
 - a. In accordance with NAAWS Section 4 - Sheet Products.
 - b. Minimize seams.
2. Laminate Systems:
 - a. Decorative Laminate:
 - 1) Horizontal Surfaces: Post-formed Grade HGP (0.042").
 - 2) Vertical Surfaces: Grade VGP (0.027").
 - a) Pattern direction: Vertical, unless otherwise noted.
 - b. Edgebanding:
 - 1) Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 0.5 mm thick elsewhere. Color to match adjacent material.
3. Wood Veneer Systems:
 - a. Match existing: Species, cut, and grade to match existing modular casework.
 - b. New construction: Premium grade match, uniform color, "well matched."
 - c. Edgebanding:
 - 1) Typical: Rigid PVC extrusions, coordinate color with wood veneer finish, 3 mm thick at doors and drawer fronts, 0.5 mm thick elsewhere. Color to match adjacent material.
 - 2) Music Cabinet Construction: Rigid PVC extrusions, coordinate color with wood veneer finish, 5 mm thick at doors and drawer fronts, 0.5 mm thick elsewhere. Color to match adjacent material.
4. Solid Surface:
 - a. Decorative synthetic marble of solid (mineral and acrylic filled) Methyl Methacrylate.
5. Solid-Stave Wood "Butcher Block":
 - a. Material: Same-season-cut Maple seasoned and kiln dried, 8 percent max moisture content.
 - b. Construction: Jointed edge grain stave, thickness as shown on drawings. Radius Edge.
 - c. Provide 1 inch by 6 inch back and end splashes.
 - d. Finish: three coats VOC compliant natural lacquer.

1. Cabinet Liner:
 - a. Complying with requirements of NEMA LD-3, Grade CLS.
2. Edgebanding:

- a. Rigid PVC extrusions, through color with satin finish.
 - 1) Typical: 0.5 mm thick.
 - 2) Front edge of shelves and all edges of drawers: 3 mm.
- C. Concealed Materials:
 - 1. Medium Density Fiberboard (MDF): ANSI A208.2.
 - a. Grade 130.
 - b. Grade 155.
 - 2. Particleboard: ANSI A208.1, Grade M-2.
 - a. 44-50 lb Industrial Grade core.
 - b. Thickness Swell max: 5.5 percent.
 - 3. Veneer Core Hardwood Plywood (VCHP):
 - a. No internal voids.
 - b. MDF cross bands to limit telegraphing of core grain is acceptable.
- D. Fasteners:
 - 1. Per NAAWS.
 - 2. Corrosion resistant fasteners throughout the assembly of modular casework.
 - 3. Conformat screws.

2.3 FABRICATION

- A. General:
 - 1. In accordance with NAAWS Section 10 - Casework, Custom Grade, as amended by the Contract Documents.
 - 2. Interface Style, Frameless: Flush Overlay.
 - 3. Seismic Force Requirements - The types of construction approved by WI that meet CBC Title 24 seismic force requirements are: Lock Joint, Dowled, Dowled / Screwed Construction, Rabbeted Construction, Conformat Screws, Fully Plowed-in Back, and Backs Screwed on in rabbeted ends, tops, and bottoms. The exact method for seismic force construction is available from WI.
 - 4. Construct openings and backing as required for work done under Division 22 PLUMBING (sinks, plumbing, etc.) and Division 26 ELECTRICAL (outlets, switches, wiring, etc).
 - a. Exposed Edges: All exposed edges shall be sealed; including sink cut-outs & bottom edges of front edges.
 - 5. Cabinets ganged together or attached to the wall shall be attached with countersunk screws to prevent binding of shelves when provided later.
 - 6. Any vertical or horizontal plane surface less than four (4) foot wide and twelve (12) foot long shall be faced with one continuous sheet with the intent to minimize the number of seams throughout the work, in compliance with NAAWS Section 8 "Wall Surfacing."
 - 7. Exposed ends, panels, and back panels shall flush out with face of doors and drawer fronts.
- B. Cabinets:
 - 1. Cabinet box:
 - a. Bottoms and Ends of Cabinets: 3/4-inch particleboard.
 - b. Tops of Wall Cabinets and Tall Cabinets: 3/4-inch particleboard.
 - c. Backs of Cabinets: Particleboard.
 - 1) Concealed Backs: 1/4" minimum.
 - 2) Exposed Backs: 1/2" minimum.
 - 2. Filler Strips:

- a. Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.
3. Shelving System:
 - a. Shelf Support System:
 - 1) Metal Shelf Standards:
 - a) Surface mounted on vertical faces of cabinet.
 - b) Shelves shall be full widths of openings, flush with inside face of cabinet doors, and dadoed around shelf standards to prevent movement during seismic events.
 - 2) Bored Hole Shelf Rest Systems:
 - a) 5mm diameter holes drilled approximately 8 mm deep, 32 mm o.c.
 - b) The front and rear row of holes shall be 37 mm from the front and rear edge of the cabinet.
 - c) Provide full cabinet height holes at 32 mm o.c. in each row to allow maximum flexibility of the user to arrange shelves.
 - 3) Provide four clips for each shelf.
 - b. Shelves: Veneer Core Hardwood Plywood.
 - 1) Span less than 25-inches: 3/4-inch.
 - 2) Span greater than 25-inches: 1-inch.
 - 3) Library shelves of any span: 1-inch thick.
4. Doors:
 - a. Doors: 11/16 inch core, 3/4 inch thick finished.
 - 1) Core material: MDF grade 130.
 - b. Large doors: 1 inch core, 1-1/16 inches thick finished.
 - 1) Large doors are more than 48 inches high and more than 24 inches wide.
 - 2) Core material: MDF grade 155.
 - c. Stiles and Rails of Glazed Doors: 3/4 inch thick.
 - 1) Core material: Particleboard.
 - d. Hinges:
 - 1) Let in 1/8 inch reveals for institutional hinges.
 - 2) Up to 48" high Doors: 3 hinges unless otherwise indicated on the drawings.
 - 3) 48" to 80" high Doors: 4 hinges unless otherwise indicated on the drawings.
 - 4) Door higher than 80": 5 hinges unless otherwise indicated on the drawings.
5. Drawers:
 - a. Drawer Fronts: 3/4-inch Particleboard.
 - b. Drawer Sides and Backs: 1/2-inch Veneer-Core Hardwood Plywood.
 - 1) Joined using Conformat Screws in lieu of dowels.
 - c. Drawer Bottoms: 1/2-inch Veneer-Core Hardwood Plywood glued and dadoed into front, back, and sides of drawers.
 - d. File Drawers / Lateral File Drawers:
 - 1) Sides: 3/4-inch Veneer-Core Hardwood Plywood.
 - 2) Bottoms: 5/8 inch Veneer-Core Hardwood Plywood.
 - 3) Sides and bottoms shall be secured using 2-inch Conformat screws.
 - 4) Accessories: COMPX "Timberline" frames.
 - e. Security Panels: 1/2-inch Veneer-Core Hardwood Plywood.
 - 1) Provide Security Panels above and below all locking drawers.
6. All drawers and doors shall be locked, keyed alike in each room and with building masters and grand master.
 - a. Each room shall be keyed alike:
 - 1) Provide 4 keys per lock.
 - 2) Provide 6 master keys.

C. Countertops:

1. General: In accordance with NAAWS Section 11 -- Countertops, as amended by the Contract Documents.
 2. Laminate Countertops:
 - a. Standard: In accordance NEMA standard LD-3.
 - b. Strength: 3/16 inch maximum deflection with 150 pound load at midspan.
 - c. Surface Material: Plastic Laminate.
 - d. Backing Material: Cabinet Liner.
 - e. Core: 3/4-inch Particleboard.
 - f. Front Edge: Self-edge build-up with drip groove edge.
 - g. Front Edge: Seamless waterfall with drip groove edge.
 - h. Back Splash: 6 inch integral cove splash, unless otherwise indicated on the drawings.
 - i. End Splash: 6 inch butt end splash, unless otherwise indicated on the drawings.
 - j. Top of Splash: Square Edge.
 - k. Exposed Edges: All exposed edges shall be sealed; including sink cut-outs & bottom edges of front edges.
 3. Solid Surface:
 - a. Solid Surface thickness: 1/2 inch at counter and back splash.
 - b. Core: Veneer-Core Plywood - see drawings for thickness required.
 - c. Front Edge: Build up with drip groove edge.
 4. Wood-Stave "Butcher Block" Countertops:
 - a. Thickness: 1-3/4 inch.
 - b. Edge: Rounded.
 - c. Splashes: 6 inch butt splash.
- D. Fabrications:
1. Solid Surface:
 - a. Various locations: Thickness as noted on drawings.
 - b. Wall cladding: 1/4 inch thick unless otherwise noted.
 2. Plastic:
 - a. Pre-fabricated.
 - b. Field Fabricated.
- E. Hardware:
1. See schedule at the end of this section for typical cabinet hardware.
 2. Hardware shall be furnished and installed as required to provide a complete casework installation for overlay construction, unless noted otherwise.
 3. Provide metal strike at locks.
 4. Finish: BHMA 626 (26D), unless otherwise noted.
- F. Countertop Supports
1. Steel Support Angle and Base Plate:
 - a. Single-piece construction: All welded ground smooth, flush and level.
 - b. Finish: Galvanized.
 - c. Angle material to be A36 (Fy=36ksi).
 - d. Plate material to be A36 (Fy=36ksi).
 - e. All welding to conform to NAAWS and shall be done by certified welders.
 - f. All work shall conform to the latest edition of the American Institute of Steel Construction.
 2. RAKKS (EH Series Counter Support Brackets):
 - a. EH-1818 for counter depths up to 25"; suitable for surface mounted conditions.
 - b. EH-1824 for counter depths up to 30"; suitable for surface mounted conditions.
 - c. EH-1818FM for counter depths up to 25"; suitable for flush mounted conditions.

3. EH-1824FM for counter depths up to 30"; suitable for flush mounted conditions.

G. Translucent Panels:

1. 3FROM "Chroma", and all required 3FORM Hardware accessories as indicated on the drawings, or approved equivalent.
 - a. Color Per Interior Color Schedule
 - b. Size As indicated
 - c. Thickness 1"
 - d. Finish: Ease Edges- Matte Front and Back, and Polished Edges
 - e. Expansion Tolerance 3/16"
 - f. ASTM D 635 Flame Spread Self Extinguishing, CC2.
 - g. ASTM E 84:
 - 1) Flame Spread Class C = 76 -200
 - 2) Smoke Developed Class B = Less than or equal to 450.
 - h. Density per ASTM D 1505 1.19 g/cm3.
 - i. Water Absorption per ASTM D 570 0.20 percent
 - j. Hardware Accessories Point Support with Recessed Caps.
2. Provide manufacturer's written specifications and shop drawings for installation recommendations, and when approved will become the basis for verifying the quality of work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of conditions:

1. Prior to the execution of the work under this specification section, inspect the installed work executed under other specification sections of this Project Manual, which affect the execution of work under this specification section.
2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Coordination:

1. Coordinate work under this specification section with work specified under other specification sections to ensure proper and adequate interface of work specified under this specification section.

B. Protection:

1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.

C. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.

3.3 INSTALLATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
 - a. Provide experienced, factory trained craftspeople under manufacturers direct supervision.
2. In accordance with approved submittals.
3. In accordance with Regulatory Requirements.
4. The entire installation shall present a first class, workmanlike appearance, without open joints, tool marks or other blemishes, and subject to the Architect's approval.
5. Edges of cutouts, subject to excessive moisture, shall be sealed with a color-toned (for verification), water-resistant sealer before trim or sink rims are installed.

B. Layout:

1. Set plumb, level, and to true lines as shown on the drawings.
2. Filler panels and scribe strips or moldings, as required, shall be properly scribed to adjacent work and securely attached to cabinets as indicated on the drawings.

C. Anchorage:

1. The backs of the cabinets shall be secured to the wall backing.
2. Refer to the Drawings for the backing and anchorage details.

D. Cabinet Bases:

1. Toe Kick: Cabinet base shall be set back from the face of the cabinet 3-inches, or as indicated
2. Cabinet sides: Cabinet shall be set 3/8-inch back from the face of the cabinet.

3.4 FIELD QUALITY CONTROL

A. Inspection:

1. Schedule WI inspection with a minimum of 7 days notice of planned installation.
2. Schedule inspections and notify the Architect, Owner's Project Inspector and any other regulatory agencies of the time at least 48 hours prior to the inspection.
3. No work shall be without the inspections required by Regulatory Requirements.

3.5 ADJUSTING

- A. Test and adjust carpentry hardware. Replace damaged or malfunctioning controls and equipment.

3.6 CLEANING

A. Clean in accordance with Specification - PROJECT CLOSEOUT.

1. Clean any soiled surfaces immediately.
2. In accordance with manufacturer's written instructions and recommendations.
3. Finish shall be clean and ready for the application of any additional finishes.

3.7 PROTECTION

A. Protection from traffic:

1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.

3.8 SCHEDULES

A. Standard Cabinetry Hardware specified, or approved equivalent:

1. Hinges: Institutional Hinges for Overlay doors, 2-3/4" five knuckle with hospital tips and 2-5/8" extended side panel wing:
 - a. ROCKFORD PROCESS:
 - 1) #374 for 3/4" side panel x 3/4" thicknesses.
 - 2) #376 for 3/4" side panel x 13/16" thicknesses.
2. Pulls (Steel Wire "U" Shaped - 4" centers, 1-1/4" Projection from face of drawer or door):
 - a) JAMISON: SWP4-26D.
3. Locks (Hinged Doors and Drawers for Overlay Construction):
 - a. COMP X NATIONAL: #C8053.
 - b. Approved equivalent manufacturer:
 - 1) OLYMPUS LOCK, INC. #DCN as required.
 - c. Provide compatible strike.
 - d. OLYMPUS LOCK, INC. #DCN as required.
 - e. Approved equivalent manufacturer:
 - 1) COMP X NATIONAL: #C8053.
 - f. Provide compatible strike.
4. Locks (Sliding Doors):
 - a. COMP X NATIONAL: #C8142 (3/4").
 - b. Approved equivalent manufacturer:
 - 1) KNAPE AND VOGT.: #KV984.
 - c. Provide compatible strike.
5. Locks (Sliding Glass Doors):
 - a. COMP X NATIONAL: #C8140 (1/4").
 - b. Approved equivalent manufacturer:
 - 1) KNAPE AND VOGT: #KV965.
 - c. Provide compatible strike.
6. Drawer Slides up to 24 inches Wide:
 - a. Pencil Drawers:
 - 1) 65 lb capacity, full extension, lever disconnect:
 - a) ACCURIDE 2632.
 - 2) Approved equivalent manufacturer:
 - a) KNAPE AND VOGT: 4400.
 - b. General Purpose Drawers:
 - 1) 100 lb capacity, full extension, rail mount disconnect:
 - a) ACCURIDE 7432.
 - 2) Approved equivalent manufacturer:
 - a) KNAPE AND VOGT: 8400.
 - c. File Drawers:
 - 1) 150 lb capacity, full extension, rail mount disconnect:
 - a) ACCURIDE 4032.
 - 2) Approved equivalent manufacturer:
 - a) KNAPE AND VOGT: 8500.
7. Drawer Slides over 24 inches Wide:
 - a. Pencil Drawers:
 - 1) 100 lb capacity, full extension, push latch disconnect:

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- a) ACCURIDE 3732.
- 2) Approved equivalent manufacturer:
 - a) KNAPE AND VOGT: 8400.
- b. General Purpose Drawers:
 - 1) 150 lb capacity, full extension, rail mount disconnect:
 - a) ACCURIDE 3641.
 - 2) Approved equivalent manufacturer:
 - a) KNAPE AND VOGT: 8500.
- c. File Drawers:
 - 1) 200 lb capacity, full extension, rail mount disconnect:
 - a) ACCURIDE 3642.
 - 2) Approved equivalent manufacturer:
 - a) KNAPE AND VOGT: 8800.
- 8. File Frames for File Drawers & Lateral File Drawers.
 - a. COMPX TIMBERLINE File Frame System.
- 9. Adjustable Shelf Supports (zinc die-cast nickel plated supports) for glass shelves:
 - a. HETTICH: #1 010 564.
- 10. Adjustable Shelf Supports (zinc die-cast nickel plated supports):
 - a. HETTICH: #1 005 767.
 - b. Approved equivalent manufacturer:
 - 1) HAFELE: #282.24.720.
- 11. Adjustable Shelf Pilaster Standard and Shelf Supports:
 - a. Pilaster Standard shall be KNAPE & VOGT #255, 19-gage x 5/8" wide x 3/16" high.
 - 1) #255-WH (Epoxy-Coated White) at interior cabinet surface locations.
 - 2) #255-BRN (Brown) at exposed cabinet surface locations.
 - b. Shelf Supports shall be KNAPE & VOGT #239 ZC (Zinc Coated).
- 12. Magnetic Catcher:
 - a. AMEROCK: #CM9783-AL.
 - b. Approved equivalent manufacturer:
 - 1) KNAPE AND VOGT: #918-AL.
- 13. Wardrobe Clothes Pole:
 - a. KNAPE AND VOGT, Pole, 1-1/16"O.D., I.D. 29/32" SS tubing : #KV660.
 - b. KNAPE AND VOGT Wall Supports per tube length : #KV734 and #KV735.
- 14. Exposed Fasteners: When exposed fasteners are used, provide zinc chromate coated oval head, self-tapping phillips screws with grommet finishing washers, same finish as screws.
- 15. Tote Trays: High impact polystyrene with cardholder, 4-1/4 x 12-3/4 x 18-3/4 inch size.
- 16. Hinged Glass Doors:
 - a. 7/32 inch crystal sheet installed in accordance with WI Section 15.
- 17. Sliding Glass Doors:
 - a. 7/32 inch crystal sheet installed in accordance with WI Section 15.
 - b. Top and bottom metal tracks:
 - 1) Doors up to 24"w x 42"h: KNAPE AND VOGT #1092.
 - 2) Doors larger than 24"w x 42"h: KNAPE AND VOGT #992.
- 18. Casters: All swivel, 2 non-braking and 2 braking, with non-marking 5 inch diameter rubber wheels, manufacturer's standard finish.
 - a. FAULTLESS: #BP421-5 and #BP421-5RB.
- 19. Joint Closure:
 - a. PEMKO: #313AN.
- 20. Coat Hooks (Cast aluminum wardrobe hook):
 - a. IVES: #E IVSP581A3.

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21. Exposed Fasteners: When exposed fasteners are used, provide zinc chromate coated oval head, self-tapping phillips screws with grommet finishing washers, same finish as screws.
 22. Cabinet Catch (only when indicated on the drawings)
 - a. STANLEY #CD34.
 23. Label Plate:
 - a. HAFELE #168.02.761.
 24. Grommets, Cable Managers and Cabinet Vents:
 - a. Provide grommets, cable managers and cabinet vents in various sizes, finishes and shapes, as indicated on the drawings and as otherwise required for a complete installation.
 - b. Provide type S/S-3 Grommet for all conditions not noted. Grommets & Air Vents by DOUG MOCKETT & COMPANY, INC., or approved equivalent.
 - c. A partial listing is provided below (for other listings, see the drawings):
 - 1) Wire Manager: #WN-2A.
 - 2) Hair Dryer Holder at Printer Counter: #HD-1.
 25. Miscellaneous Hardware Items:
 - a. DEMCO, INC.:
 - 1) Maple Newspaper Sticks: #EP148-7821.
 - 2) Keyboard Drawer: #P148-0061.
 - b. HAFELE:
 - 1) Bow Handles: #102.49.402.
 - 2) Compact Disk Rails: #810.58.335.
 - 3) Video Cassette Rails: #810.58.326.
 - 4) Metal Label Frames: E168.02.789 (nickel-plated).
 - 5) Miscellaneous: Dished Sleeves, screws, washers, nuts, threaded pins, screw-in sleeves, shelf supports with locking screws, connecting fittings, & capped bolts.
 - c. NOVA:
 - 1) Mobil Pedestal: #85 series.
 - 2) Retrofit Kit: E50-0-1818.
 - d. REV-A-SHELF:
 - 1) Cutlery / Utility Trays: CT4.
 - e. CHARLES McMURRAY:
 - 1) 2" Plate Casters: #MC660-44-273.
- B. Hardware list at Modular Music Instrument Cabinets:
1. Hinges:
 - a. ROCKFORD PROCESS.
 - 1) #374 for 3/4" side panel x 3/4" thicknesses.
 - 2) #376 for 5/8" side panel x 13/16" thicknesses.
 2. Catches: HAFELE 246.03.709 magnetic catch.
 3. Pulls: HAFELE 105.25.603 metal pull.
 4. Lock Hardware: As detailed on the drawings.
 5. Identification: HAFELE 168.01.460 transparent label frame (70 mm x 23mm).

END OF SECTION

SECTION 07 18 50 – VAPOR-ALKALINITY CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment, testing and services necessary to:
 - a. Completely install all Vapor-Alkalinity Control 100 percent solids epoxy membrane materials, accessories and other related items necessary to control for water vapor and alkalinity in existing or new concrete slabs for the Project.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS (Including BID FORM)
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 30 00 CAST-IN-PLACE CONCRETE
 - 4. 09 30 00 TILE
 - 5. 09 65 16 RESILIENT SHEET
 - 6. 09 67 23 RESINOUS FLOORING
 - 7. 09 68 40 CARPET
 - 8. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
- C. Cost of Work:
 - 1. The entire cost for providing the vapor-alkalinity control specified under this Section shall be listed on the BID FORM as a Line Item and included as a part of the Base Bid. Refer to the BID FORM.
 - 2. If it is determined by way of testing, and it is agreed to by the Owner, Architect, Contractor, and the Flooring Installer, that the work of this Section is not required, then this Work (or a portion of this Work agreed to by the Owner, Architect and the Contractor) for the Installation of the Vapor-Alkalinity Control Membrane System will be deleted from the Project by the way of a Change Order, and the Contract Sum shall be reduced accordingly.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. ACI American Concrete Institute
 - 1) ACI Committee Report 201 "Guide to Durable Concrete"
 - b. ASTM American Society for Testing Materials International

1.3 DEFINITIONS

- A. Membrane System: "Water Vapor-Alkalinity Membrane System."
- B. New Concrete Slab: Any concrete slab poured after the signing of the Contract for this Project, regardless of the duration of the construction period.
- C. Existing Concrete Slabs: Any slabs existing (or poured) prior to this Project.
- D. pH: Alkalinity.
- E. RH: Relative Humidity.
- F. MVER: Moisture Vapor Emission Rate.
- G. Hg: Mercury.

1.4 SYSTEM DESCRIPTION

- A. The Moisture Vapor Control System shall be specifically formulated and marketed for concrete floor slab moisture vapor and pH control.
- B. Membrane System Performance Requirements: It is the intention of this section to form a guide for a complete membrane system. Any items not specifically noted but necessary for a complete membrane system shall be provided under this section. Membrane System shall comply with the following:
 - 1. Shall control alkalinity for a long term maximum resistance of pH 14 per pH Testing of ASTM F 710 "Preparing Concrete Floors to Receive Resilient Flooring."
 - 2. Shall control vapor transmission up to and including 100 percent readings per RH Testing of ASTM F 2170 "Determining Relative Humidity in Concrete Floor Slabs Using *in situ* Probes".
 - 3. Perm Rate Results (net perms - grains /hr/sq.ft. in 1 inch of Hg) of the membrane system shall not exceed:
 - a. New Concrete Slabs: 0.09 grains/sq. ft./hour in 1 inch of Hg or less per ASTM E 96 "Water Vapor Transmission of Materials" per the Water Method for new concrete slabs.
 - b. Existing Concrete Slabs: 0.05 grains/sq. ft./hour in 1 inch of Hg or less per ASTM E 96 "Water Vapor Transmission of Materials" per the Water Method for renovation work on existing slabs.
 - 4. Compatible with all types of floor covering products and systems specified for this project.
 - 5. Independently tested with certified results.
 - 6. Contain no silicate or water/alkaline soluble compounds.
 - 7. Capable of the following in an environment of constant water vapor and water exposure:
 - a. System shall be capable of curing well when water saturation of the surface underneath coatings can begin within a short period of time depending on the amount of osmotic water/moisture permeating through the concrete.
 - b. Rapid adhesion to the substrate without jeopardizing the long term bonding performance.
 - 8. Sufficient density to avoid water vapor damage to other adhered systems.
 - 9. Resistant to most commonly encountered acids/solvents in case of topical exposure (spills).

1.5 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data:
 - a. Manufacturer's Data for each type of product specified.
 - 2. Quality Assurance/Control:
 - a. Test Reports:
 - 1) Independent Testing Laboratory test results for RH (relative humidity) in concrete.
 - 2) Independent Testing Laboratory test results for pH on concrete.
 - 3) Contractor test results for Perm Rating of the Membrane System that the net perms test results shall be submitted with verification that lab applied the manufacturer's product to the test samples.
 - b. Manufacturer's Instructions:
 - 1) Written installation instructions.
 - c. Manufacturer's Field Reports:
 - 1) Written field report detailing installation observations.
 - 2) Final field report after curing indicating installation was performed properly.
 - d. Qualification Statements

- 1) Manufacturer's Membrane System Performance requirement letter.
 - 2) List of Previous Projects.
 - 3) Manufacturer's Installer Certification.
 - 4) Manufacturer's Duration of Experience.
3. Closeout Submittals:
- a. In accordance with Specification Section – PROJECT CLOSEOUT.
 - b. In accordance with this specification and with Specification Section – WARRANTIES.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Material Qualifications:
 - a. All items shall be within the Membrane System Performance Requirements specified earlier within this specification section.
 - b. Provide list of at least three (3) projects available for inspection employing same vapor-alkalinity control system(s) within the last ten (10) years, within the same climate zone.
2. Installer Qualifications:
 - a. Engage an experienced Installer who is certified in writing by the manufacturer listed herein as qualified to install manufacturer's product (or system) in accordance with manufacturer's warranty requirements.
3. Manufacturer's Qualifications:
 - a. Firm regularly engaged in the business and manufacture of vapor emission and alkalinity control installations of similar size and complexity with the system proposed for use, and have had experience for at least ten (10) years of manufacturing water-vapor reduction systems with the product submitted.

B. In accordance with Specification Section - REGULATORY REQUIREMENTS.

C. Mock-Up:

1. Install the Moisture Control System in a minimum 100 sq. ft. mock-up area, using the same methods, laborers and equipment that will be used for the entire installation. Test tensile bond strength of the moisture mitigation system to the concrete substrate following ASTM Test Method D 7234. The results shall be equal to or greater than 200 psi with failure in the concrete before proceeding with installation of the moisture control system.

D. Meetings:

1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - c. Review delivery, storage, and handling procedures.
 - d. Review project conditions.
 - e. Review condition of concrete slabs on grade.
2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintaining installed work until the Notice of Substantial Completion has been executed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at Site:
 - 1. Products must be in manufacturer's original unopened containers with labels indicating brand name and product name.
 - 2. Damaged products will not be accepted.
- B. Storage and protection:
 - 1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units, in a locked, clean and neat, well ventilated area.
 - a. Cover material with protective water proof covering providing for adequate air circulation and ventilation.
 - b. Empty containers shall not be removed from the site, unless approved by the Architect.

1.8 PROJECT CONDITIONS

- A. Environmental requirements:
 - 1. Temperature:
 - a. Maintain ambient temperature in all spaces to receive independent testing and membrane system installation between sixty-five (65) degrees Fahrenheit and seventy-eight (78) degrees Fahrenheit for seven (7) days prior, during, and after installation.
 - b. Inform the Owner of ambient temperature in space to receive independent testing and membrane system installation and maintain until Substantial Completion and turn-over of the building or facility to the Owner.
 - 2. Ventilation:
 - a. During membrane system installation provide continuous ventilation and indirect air movement at all times during application and curing process.
- B. Existing conditions:
 - 1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 - 2. Concrete surfaces shall have cured for not less than twenty-eight (28) days before independent testing.
 - 3. Not less than seven (7) days shall have passed since surfaces were last wet.

1.9 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with specification section - WARRANTIES
- B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty.
 - a. Manufacturer's warranty shall cover against water vapor transmission or out of range levels of alkalinity failure through concrete slabs and includes all labor and material costs for replacement of all products installed over the membrane system.
 - b. Warranty period Fifteen (15) Years.
- C. Installer's Warranty:
 - 1. In accordance with the terms of Specification Section – WARRANTIES:
 - a. Warranty period Five (5) Years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 - 1. Membrane System for New Concrete Slabs - Specified product manufacturer:
 - a. KOESTER AMERICAN CORP. "VAP I 2000 SYSTEM"
 - b. Approved equivalent manufacturers:
 - 1) ALLIED CONSTRUCTION TECHNOLOGY 2170.
 - 2) MAPEI "Planiseal VS."
 - 2. Membrane System for Existing Concrete slabs - Specified product manufacturer:
 - a. KOESTER AMERICAN CORP. "VAP I 2000FS SYSTEM"
 - b. Approved equivalent manufacturers:
 - 1) ALLIED CONSTRUCTION TECHNOLOGY 2170 Fast Setting Product.
 - 2) MAPEI "Planiseal VS" Fast Setting Product.
 - 3. Core Testing Repair Product:
 - a. CTS CEMENT "RAPID SET CEMENT"
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. General:
 - 1. Membrane System shall be the product of one manufacturer.
- B. Membrane System for New Concrete Slab Substrates: One (1) Coat, epoxy 100 percent solids system, containing specifically formulated chemicals and resins complying with the Performance Requirements specified. No silicate or water based formulations are allowed.
 - 1. Pot Life 12 minutes.
 - 2. Cure-Time 12 hours.
 - 3. Solid Content 100 percent.
 - 4. VOC, mixed Less than 10 g/L.
 - 5. Flash Point Greater than 200 degrees F.
 - 6. Storage Between 50 degrees F - 90 degrees F.
 - 7. Shelf Life 1 Year minimum in original sealed container.
- C. Membrane System for Existing Concrete Slab Substrates: One (1) Coat, epoxy 100 percent solids fast setting system, containing specifically formulated chemicals and resins complying with the Performance Requirements specified. No silicate or water based formulations are allowed.
 - 1. Pot Life 12 minutes.
 - 2. Cure-Time 4 hours.
 - 3. Solid Content 100 percent.
 - 4. VOC, mixed Less than 10 g/L.
 - 5. Flash Point Greater than 200 degrees F.
 - 6. Storage Between 50 degrees F - 90 degrees F.
 - 7. Shelf Life 1 Year minimum in original sealed container.

2.3 ACCESSORIES

- A. Bonding Material (if required): Provide membrane manufacturer's written recommended bonding emulsion materials compatible with the membrane system.
- B. Crack and Joint Filler:
 - 1. Provide membrane system manufacturer's written recommended crack and joint materials compatible with the membrane system.

2.4 MIXES

- A. Vapor-Alkalinity Control Membrane System:
 - 1. Use clean containers.
 - 2. Mix thoroughly as per manufacturer's written requirements to obtain a homogeneous mixture.
 - a. Use a low speed motor less than 400 rpm and a two bladed "jiffy mixing blade" only. DO NOT AERATE! Mix ratios are measured by volume.
 - b. Specified membrane system shall have its components mixed at a ratio of 2.4:1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 - 1. Preparation shall not begin until the Owner, Architect, and Contractor have reviewed independent testing laboratory results of Alkalinity and Relative Humidity testing and have informed the membrane system manufacturer and installer of areas where the membrane system is to be installed.
 - 2. Prior to the execution (preparation) of the work under this specification section, the Owner's representative shall inspect the installed work executed under other sections of this Project Manual that affect the execution of work under this specification section.
 - a. Membrane System Installer to investigate and inform the membrane system manufacturer if Alkali-Silica Reaction is present, and/or oil contamination, concrete additives (using chlorides), or any other soluble compounds that can contaminate surfaces have been used in any concrete mix, or is present in the existing concrete substrate.
 - 3. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 - 4. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Coordination:
 - 1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
- B. Protection:
 - 1. Protect all adjacent surfaces from drips, spray, air pollution of the surrounding environment, and other damage from work under this specification section.
- C. Surface preparation:
 - 1. Comply with ASTM F 3010 "Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings."

2. After the Testing Laboratory removal of all RH probes, fill all RH Test holes with core repair product in accordance with membrane manufacturer's written recommendations, and allow curing before any other cleaning occurs.
3. Clean all surfaces to receive membrane system.
4. "Shotblast" all floors and clean surfaces with a dust contained vacuum to remove all residue off the substrate to a minimum CSP (Concrete Surface Profile) of 3. Shotblast existing areas to a minimum of CSP 4. Systems introducing water or acids to the floor systems (such as "Hydrablasting" or "Acid Etching") are NOT ALLOWED.
 - a. Grinding floor areas is only allowed when floor areas are inaccessible by "Shotblasting".
 - 1) Grind to a CSP as recommended in writing by the membrane system manufacturer, but in no cases less than 3.
 - a) Existing slabs shall be no less than 4.
 - 2) Where surface profiles require (because of silicate or other bond breaker film applications), grind to a higher level of CSP, as required in writing by the membrane system manufacturer for removal of film items not compatible with the system membrane.
 - b. Protect electrical or mechanical equipment items in place from dust and particulate residue that could impede their proper operation.
 - c. Remove ALL defective materials and foreign matter such as dust, adhesives, leveling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, "shotblast" bb's, etc.
 - d. Remove, after "shotblasting," leaving no reinforcing fibers (if any) left on the concrete surfaces.
 - 1) Reinforcing fibers must be burned off, scraped and vacuumed.
5. Repair all cracks, expansion joint, control joints, and open surface honeycombs and fill in accordance with crack and joint filler manufacturer's written recommendations.
 - a. Mix with silica sand for large cracks or voids.
6. Provide an uncontaminated, absorptive, sound surface.

3.3 APPLICATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
2. In accordance with approved submittals.
3. In accordance with Regulatory Requirements.
4. Verify that required repairs and fills are complete, cured, and dry before application.

B. Assistance:

1. Application shall be in direct consultation and review of manufacturer's representative.

C. System Application:

1. The coverage rate for the provided system shall be based on the surface texture and porosity of the substrates as well as the measured level of moisture from the examination of the substrates after surface preparation, and in accordance with manufacturer's written instructions. Approximate minimum coverage of the specified membrane system relative to existing levels of moisture vapor after surface preparation are as follows:
 - a. New concrete slabs 150 sq. ft. / gal.
 - b. Existing concrete slabs 130 sq. ft. / gal.
 - c. Apply one coat of the specified system at the written recommended rates (see above) using a squeegee and or a 3/8 inch nap roller leaving NO areas untreated.
 - d. Allow the substrate to cure a minimum of:
 - 1) New concrete slabs: 12 hours before installing underlayment or flooring system.

- 2) Existing concrete slabs: 4 hours before installing underlayment or flooring system.

3.4 FIELD QUALITY CONTROL

A. Site Tests:

1. Prior to the execution (preparation) of the work of this specification section, the Project Inspector will arrange with the Independent Testing Laboratory to perform the following tests:
 - a. Alkalinity Testing per ASTM F 710 "Preparing Concrete Floors to Receive Resilient Flooring."
 - b. Relative Humidity Testing per ASTM F 2170 "Determining Relative Humidity in Concrete Floor Slabs Using *in situ* Probes."
2. Test only concrete slabs scheduled to receive floor coverings.
3. Test only when concrete floor slabs have cured a minimum of 28 days.
4. Test only when the concrete slabs have been acclimated to final environmental conditions as specified in the Article PROJECT CONDITIONS within this Specification Section.

B. Inspection:

1. Schedule inspections and notify the Architect, Project Inspector, and any other regulatory agencies of the time at least 48 hours prior to the inspection.
2. No work shall proceed without the inspections of the Project Inspector.

C. Manufacturer's Field Services:

1. Membrane System Manufacturer shall field verify and report on observations of system application per manufacturer's recommendations during installation.
2. Membrane System Manufacturer shall issue a Final Field Report, after curing, indicating installation was completed per manufacturer's recommendations.

3.5 CLEANING

A. Cleaning:

1. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
2. Clean any soiled surfaces immediately.
3. Remove all debris resulting from specified system installation from project area.
4. Finish shall be clean and ready for the application of any additional finishes.
5. Clean all tools and equipment as recommended in writing by the manufacturer.

3.6 PROTECTION

A. Protection:

1. Protect membrane system during specified cure periods from any kind of traffic, topical water, and contaminants.

END OF SECTION

SECTION 07 21 00 – INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide all material, labor, equipment and services necessary to completely install all Insulation, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 05 12 00 STEEL AND FABRICATIONS
 - 4. 06 10 00 ROUGH CARPENTRY
 - 5. 07 60 00 SHEET METAL
 - 6. 08 11 00 METAL DOORS AND FRAMES
 - 7. 09 22 16 METAL FRAMING
 - 8. 09 29 00 GYPSUM BOARD
 - 9. 09 50 00 ACOUSTICAL CEILINGS
 - 10. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 11. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. MIMA Mineral Insulation Manufacturers Association
 - b. NFPA National Fire Protection Association
 - c. TIMA Thermal Insulation Manufacturers Association

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data.
 - a. Product Data on materials and accessories.
 - 2. Quality Assurance/Control Submittals:
 - a. Manufacturer's Written Instructions:
 - 1) Submit three (3) copies of manufacturer's written instructions.
 - 3. Closeout Submittals in accordance with the following:
 - a. Warranty in accordance with Specification Section - WARRANTIES.

1.4 QUALITY ASSURANCE

- A. In accordance with California Quality Standards.
- B. The R values for the insulation materials shall be in accordance with "The Standard Mineral Wool Building Insulation" latest Edition of the MIMA.
- C. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. ASTM American Society for Testing and Materials
 - b. CDPH California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers"

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage of Materials:

1. All Materials shall be delivered and stored in original unopened packages with manufacturer's name and contents legibly indicated. Materials shall be stored in a dry place, and protected from damage.

1.6 WARRANTY

A. Contractor's General Warranty:

1. In accordance with Specification Section - WARRANTIES.

B. Manufacturer's Warranty:

1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.

C. Installer's Warranty:

1. In accordance with the terms of the Specification Section - WARRANTIES
 - a. Warranty Period One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.

1. Specified blanket insulation product manufacturer:
 - a. OWENS CORNING
 - b. Acceptable alternative manufacturers:
 - 1) CERTAINTEED
 - 2) JOHNS MANVILLE CORPORATION
2. Specified sound blanket insulation product manufacturer:
 - a. OWENS CORNING
 - b. Acceptable alternative manufacturers:
 - 1) CERTAINTEED
 - 2) JOHNS MANVILLE CORPORATION
3. Specified sound deadening board product supplier:
 - a. BLUE RIDGE FIBERBOARD "SoundStop."
4. Specified draft stop insulation product manufacturer :
 - a. THERMAFIBER "Thermafiber."
5. Specified foundation insulation product manufacturer:
 - a. DOW CHEMICAL COMPANY "Styrofoam."
6. Specified rigid roof board insulation product manufacturer:
 - a. SARNAFIL "Sarnatherm ISO."
 - b. Acceptable Alternative Manufacturers:
 - 1) ATLAS.
 - 2) JOHNS MANVILLE CORPORATION.
 - 3) TREMCO.
7. Specified rigid wall board insulation product manufacturer:
 - a. RMAX (a SIKA company) "ECOMAXCI FR"
 - b. Acceptable Alternative Manufacturers:

- 1) ATLAS.
- 2) JOHNS MANVILLE CORPORATION.
- 3) TREMCO.
8. Specified acoustical blanket insulation product manufacturer:
 - a. OWENS CORNING "Select Sound Black Acoustical Fiberglass Blanket."
9. Specified Sound Attenuation Fire Blanket (SAFB) Rock Wool Insulation product manufacturer:
 - a. ROXUL AFB.
10. Specified Foamed-In-Place Insulation product manufacturer:
 - a. DOW CHEMICAL "Great Stuff Pro."
11. Specified poultry netting, and FSK tape product manufacturer or approved equivalent:
 - a. INSULATION MATERIALS.
12. Specified welded stud stick pins and self-locking washers product manufacturer or approved equivalent:
 - a. SUNBELT STUD WELDING.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

A. Thermal Blanket:

1. Construction in accordance with the following:
 - a. Type I: Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with a maximum flame-spread and smoke-developed indices of 25 and 50, respectively, per ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials"; passing ASTM E 136 "Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C," for combustion characteristics.
 - 1) Unless otherwise noted, blankets without vapor-retarder membrane coverings, used in Interior partitions not subject to moisture.
 - b. Type II: Kraft-faced, Glass-Fiber Blanket Insulation: ASTM C 665 "Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing," Type II (non-reflective faced), ASTM E 84 Class C (faced surface not rated for flame propagation); Category I (membrane is a vapor barrier).
 - 1) Unless otherwise noted, this type of insulation should only be used in conditions not "subject to view" (enclosed cavities) or in attics where a finished ceiling is provided and the attic is not used as a return air plenum.
 - c. Type III: Reinforced-Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665 "Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing," Type III (reflective faced), ASTM E 84 Class A (faced surface with a foil-scrim or foil-scrim-kraft facing)
 - 1) Unless otherwise noted, this product shall be used when the attic (although enclosed by a finished ceiling) is used as a return air plenum, or used in "exposed-to-view" exterior and interior walls and ceilings or attics subject to moisture and fire-rated conditions.
2. Thermal Resistance (R) values required (minimum) for blanket insulation, unless otherwise indicated on the drawings:
 - a. Roof Blanket Insulation: R-30.
 - b. Wall Blanket Insulation: R-19.
 - c. Floor Blanket Insulation: R-30.
 - d. Attic Spaces: All attic spaces shall have continuous insulation of the proper type and with a minimum thermal resistance "R" value of R-30 for insulation only. Where attic spaces have vertical elements above ceilings, these shall be insulated as part of the attic space to R-30 minimum.

3. Thickness: No more than will fit into the space available without compressing. Where insulation is confined between finishes, which would compress the material, high efficiency insulation shall be used to provide the required resistance value.
- B. Sound Blanket:
 1. Sound Attenuation Batts, unfaced, as manufactured by OWENS CORNING ECOTOUCH SOUND ATTENUATION BATTS, 2-1/2" batts for wood or metal frame construction, complying with ASTM C 665 "Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing," Type I, and ASTM E 136 "Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C."
 - a. Flame Spread Index Maximum 25.
 - b. Smoke Developed Index Maximum 50.
- C. Sound Deadening Board: "SoundStop" 1/2 inch thick Sound Deadening Board, manufactured in accordance with ASTM C 208 "Specification for Cellulosic Fiber Insulating Board," as supplied by BLUE RIDGE FIBERBOARD.
 1. Density: 17.5 - 18 pcf.
 2. Thermal Conductivity 0.38.
 3. Tensile Strength (parallel to surface): 150 psi.
 4. Tensile Strength (perpendicular to surface): 600 psi.
 5. Water Absorption by Volume, max. percent: 2 hour immersion, 7 percent max.
 6. Expansion, 50 to 90 percent relative humidity: 0.5 percent.
 7. Vapor Permeance, grains/hr/sq.ft.in. HG 5.
 8. Flammability (per NFPA rating): 1 or slight.
 9. R-Value 1.3.
 10. Sound Transmission Coefficient (STC): 44 - 51.
- D. Draft Stop:
 1. 2" minimum to 4" thick Safing Insulation, as required on the drawings. Provide manufacturer's written recommended fasteners as required for the specific installation requirements.
 - a. Flame Spread and Smoke Developed Index maximum as follows in accordance with ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials":
 - 1) Unfaced Safing Insulation:
 - a) Flame Spread Index 15
 - b) Smoke Developed Index 0.
 - 2) Foil Faced Safing Insulation:
 - a) Flame Spread Index 25
 - b) Smoke Developed Index 5.
- E. Foundation:
 1. 3/4" thick "STYROFOAM" brand square edge, rigid board insulation as manufactured by DOW CHEMICAL COMPANY, or approved equivalent.
 - a. In accordance with ASTM C578 "Specification for Rigid, Cellular Polystyrene Thermal Insulation," Type IV with an average R-Value of 5.0 per inch when tested at 75 degree F mean temperature in accordance with ASTM C518 "Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus."
 - b. Provide manufacturer's written recommended fasteners and adhesive for substrate conditions.
- F. Rigid Board:
 1. Roof Board:
 - a. In accordance with:

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- 1) ASTM C 1289 "Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board," Type 2, Class 1, isocyanurate with front and back glass fiber/organic mat paper-facers (balanced panel), conditioned "R" value of 8.6 per 1.5 inchs minimum, in accordance with ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials," and ASTM D 1621 "Test method for Compressive Properties of Rigid Cellular Plastics."
 - a) Flame Spread Index Maximum, core: 25 or less.
 - b) Smoke Density Developed Index Maximum, core: 450 or less.
 - c) Compressive strength: 20 PSI.
 - d) 4' x 4' or 4' x 8' panels.
2. Wall Board:
 - a. Isocyanurate with front and back aluminum foil-faced (balanced panel).
 - b. General: Tested to meet NFPA 285 "Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components."
 - c. In accordance with:
 - 1) ASTM C 1289 "Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board," Type 1, Class 1.
 - 2) ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials," and ASTM D 1621 "Test method for Compressive Properties of Rigid Cellular Plastics."
 - d. Properties:
 - 1) NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Pass.
 - 2) Flame Spread Index Maximum, ASTM E 84: 25 or less.
 - 3) Smoke Density Developed Index Maximum, ASTM E 84: 450 or less.
 - 4) Compressive strength: 25 PSI.
 - 5) 4' x 4' or 4' x 8' panels.
 - 6) R value per inch: 6.0.
- G. Acoustical Blanket:
 1. Provide 1" thick Black Fiberglass acoustical blanket complying with ASTM C 533 "Specification for Calcium Silicate Block and Pipe Thermal Insulation," Type III, and ASTM C 423 "Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method."
 - a. Flame Spread Index Maximum 25.
 - b. Smoke Density Developed Index Maximum 50.
 - c. Noise Reduction Coefficient, per ASTM C423 0.70, minimum.
- H. Sound Attenuation Fire Blanket Insulation (SAFB) - Rock Wool:
 1. Mineral Wool batts complying with ASTM C 665, Type 1 (without membrane facings), and rated non-combustible per NFPA Standard 220 per ASTM E 136 "Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C."
 - a. Flame Spread and Smoke Developed Index maximum as follows in accordance with ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials":
 - 1) Unfaced:
 - a) Flame Spread Index 0.
 - b) Smoke Developed Index 0.
 - b. Nominal Density 2.5 pcf.
 - c. "K" at 75 degrees BTU. in/hr sq. ft. degrees fahrenheit 0.27.
 - d. "R" Value per inch of thickness 3.7.
- I. Foamed-In-Place Insulation:

1. Low Pressure Type: Semi-flexible soft, single-component polyurethane sealant, to CAN/ULC-S710.1, and having the following properties:
 - a. Core Density (ASTM D 1622) 1.7 pcf.
 - b. Fire Resistance (ASTM E 84) Flame Spread = 10, Smoke Developed = 20.
 - c. Color: Yellow.
 - d. Cure Time: Approximately 12 hours.
 - e. Tack Free Time: 6 - 9 minutes.
 - f. Applicator: Gun applied.

2.3 ACCESSORIES

- A. Staples:
 1. Hammer type.
- B. Wire:
 1. Sixteen (16) gage line wire.
- C. All other materials such as fasteners (i.e. insulation netting, line wires, stick-pins), and retainers not specifically described, but required to complete the work, shall be as recommended by approved manufacturer, and installed by the Contractor. Contractor shall choose the appropriate fastener or system for the cavity space or area to be insulated without letting the insulation sag.
 1. Poultry Netting: As distributed by INSULATION MATERIALS.
 - a. 2" hexagonal, 20 gage galvanized in rated assemblies.
 2. FSK Tape: As distributed by INSULATION MATERIALS.
 - a. VENTURE TAPE product #1525CW.
 3. Welded Stud Stick Pins: As distributed by SUNBELT STUD WELDING.
 - a. Provide low-carbon "mild" steel, with the following properties:
 - 1) Tensile Strength: 60,000 psi.
 - 2) Yield: 50,000 psi.
 - 3) Elongation: 20% (in 2 inches).
 - b. Size: 12 gage.
 - c. Length sufficient to hold insulation to underside of decking, and extended enough to allow self-locking washers to hold insulation in place without crushing the insulation.
 - d. Spacing: 24 inches o.c.
 - 1) Pins shall be placed within 3 to 5 inches of all area edges.
 - e. Self-Locking Washers:
 - 1) 2 inch diameter, galvanized, compatible with welded stud stick pin size and gage.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 1. All building(s) shall have a complete thermal envelope of thermal blanket or rigid board insulation.
 - a. Do not install insulation until the construction has progressed to the point that inclement weather will not damage or wet the insulation material.
 - b. Install in accordance with manufacturer's written recommendations.
 - c. Insulation shall fit snugly between framing members without voids. Fully insulate all areas between all framing members, cutting and fitting as required.
 - d. Attach insulation to inside face of framing members.

INSULATION

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- 1) Wood Framing: Friction fit to keep from falling down within wall cavity. Attach with Hammer Staples at 6 inches on center with minimum staple penetration of 3/8 inch when insulation has a membrane facing.
 - 2) Metal Framing: Friction fit to keep from falling down within the cavity and use line wire across metal studs. Omit wire and spot tape with FSK Tape when insulation has a membrane facing.
 - e. Vapor-Retarder Membrane: Shall be continuous and without unnecessary joints.
 - 1) At roof structure and exterior walls, after securing the insulation facing flanges, provide FSK Tape over all of the insulation facing butt joints and all overlapping facing flanges, so as to create a continuous vapor-retarder membrane at underside of the roof deck and inside of walls.
 - 2) Patch all tears, rips and holes in the vapor-retarder membrane.
 - f. Cut and fit insulation material around pipes, conduits and outlet boxes, as necessary to maintain the full integrity of the insulation.
- B. At Roof Framing:
1. Install thermal roof blanket Insulation between all exterior roof framing members.
 - a. Wood Framing: Attach wire to framing with staples with minimum staple penetration of 5/8 inch.
 - b. Metal framing: Attach with line wires perpendicular to framing at 12 inches on center.
- C. At Wall Framing: Install thermal wall blanket insulation between all exterior wall framing members.
- D. At Floor Framing: Install thermal floor blanket insulation between all exterior floor framing members.
- E. Sound Insulation:
1. Install sound attenuation batts between all interior wall framing members.
 2. Install sound attenuation batts between all floor framing members.
 3. Install sound deadening board over interior wall framing members.
- F. Draft Stop Insulation:
1. Install Draft Stop Insulation where required.
- G. Rigid Board Insulation:
1. Install per manufacturer's written recommendations.
 2. Wall Board: Tape all edges as part of the rigid board system.
- H. Acoustical Blanket:
1. Install Acoustical Blanket where indicated and per manufacturer's written recommendations.
- I. Sound Attenuation Fire Blanket (SAFB):
1. Interior Stud Cavity: Friction fit SAFB's securely between studs. Butt ends of blankets closely together and fill voids.
 2. Creased SAFB: Bow the blankets slightly to fit into stud cavity. Slit the blankets vertically 1" deep with a utility knife.

END OF SECTION

SECTION 07 60 00- SHEET METAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all Sheet Metal materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 05 12 00 STEEL AND FABRICATIONS
 - 4. 06 10 00 ROUGH CARPENTRY
 - 5. 06 41 23 MODULAR CASEWORK
 - 6. 07 21 00 INSULATION
 - 7. 07 72 00 ROOF ACCESSORIES
 - 8. 07 92 00 SEALANTS
 - 9. 08 11 00 METAL DOORS AND FRAMES
 - 10. 09 22 00 METAL FRAMING
 - 11. 09 91 00 PAINTING
 - 12. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 13. 11 40 00 FOOD SERVICE EQUIPMENT
 - 14. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. DOD Department of Defense
 - 2. LIA Lead Industries Association.
 - 3. NRCA National Roofing Contractors Association
 - 4. SMACNA Sheet Metal and Air Conditioning Contractor's National Association, 6th Edition, Architectural Sheet Metal Manual.
 - 5. SSPC The Society of Protective Coatings

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Shop Drawings.
 - a. Submit shop drawings showing fabrication and installation of the work of this section including plans, elevations, sections, details of components, and attachments to other units of work.
 - 2. Closeout Submittals in accordance with Specification Sections in Division One:
 - a. Warranty in accordance with Specification Section - WARRANTIES.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Material Qualifications:
 - a. Work shall be in accordance with Standards and details set forth in latest edition of the SMACNA Manual and Specifications unless indicated otherwise.

- b. The roofing manufacturer and installer selected for this project will select the roof flashing material and detailing for all roof penetrations compatible with the roofing system used and the warranties required. The schedule for roofing penetrations at the end of this section and the details contained within the drawings are minimum standards required for this project.
 - 2. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
- B. Regulatory Requirements: In accordance with Specification Section - REGULATORY REQUIREMENTS.

1.5 PROJECT CONDITIONS

- A. Existing Conditions:
 - 1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 - 2. Conduct work so as not to interfere unnecessarily with adjacent roads, streets, drives and walks.

1.6 WARRANTY

- A. Contractor's General Warranty: In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty: In accordance with Specification Section - WARRANTIES.
 - 1. Warranty Period Five (5) Years.
- C. Installer's Warranty:
 - 1. Workmanship and Materials Warranty:
 - a. Warranty Period Five (5) years.
 - b. Upon project completion and acceptance, the subcontractor shall issue Owner a warranty against defective workmanship and materials.
 - c. The subcontractor shall warranty to maintain the roof flashing in a watertight condition for the period of years specified from the date of acceptance and shall be responsible for the repair of any failure that is the result of defects in materials and workmanship.
 - d. The subcontractor shall obtain from the Roofing Installer and the General Contractor a co-endorsement of the Warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 - 1. Specified product manufacturer:
 - a. Ice and Water Shield:
 - 1) GRACE CONSTRUCTION PRODUCTS
 - a) ICE and WATER SHIELD HT.

- 2) Acceptable alternative manufacturers:
 - a) CARLISLE COATINGS & WATERPROOFING - CCW WIP 400.
 - b. Penetration Flashing:
 - 1) GRACE CONSTRUCTION PRODUCTS "VYCOR V40."
 - 2) Acceptable Alternative Manufacturer:
 - a) FORT-I-FIBER "Fort-I-Flash 40."
 - b) TYVEK "FlexWrap" and "Straight Flash."
 - c. Reglets:
 - 1) FRY REGLET CORPORATION.
 - d. Primer Paint:
 - 1) DEVOE COATINGS PAINT.
 - e. Galvanized Repair Paint:
 - 1) RECTORSEAL.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

A. Sheet Metals:

1. Steel Sheet:
 - a. Zinc-Coated, Commercial quality with 0.20 percent copper, ASTM A 653 "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanealed) by the Hot-Dip Process," G-90 hot-dip galvanized, mill phosphatized where indicated for painting; 0.0359 inch thick (20 gauge) minimum, except as otherwise indicated.
2. Lead Sheet:
 - a. ASTM B 749 "Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products," Type L51121, copper-bearing sheet lead, minimum 4 lb/sq. ft. (0.0625 inch thick) minimum for burning (welding) unless otherwise indicated.
3. Aluminum Sheet:
 - a. Provide sheet aluminum in accordance with ASTM B 209 "Specification for Aluminum and Aluminum-Alloy Sheet and Plate," alloy 3003, temper H14, AA-C22A41 clear anodized finish.
 - 1) Gauge: 0.063 inches.
 - 2) Prepare anodized finish for application of primer and finish coats as indicated on the drawings.
4. Stainless-Steel Sheet:
 - a. ASTM A 167 "Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip," Type 304, soft annealed, with No. 4 finish, except where harder temper is required for forming or performance; minimum 0.0625 inch thick (16 gauge), unless otherwise indicated.

2.3 MANUFACTURED UNITS

A. Reglets:

1. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.
2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
3. Plaster Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

5. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
6. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.
 - a. Material: Galvanized steel, thickness matching material being installed, unless otherwise noted.

2.4 ACCESSORIES

- A. Solder:
 1. For galvanized steel: ASTM B 32 "Specification for Solder Metal," Grade Sn50, used with rosin flux.
 2. For stainless steel: ASTM B 32 "Specification for Solder Metal," Grade Sn60, used with an acid flux of type recommended by stainless-steel sheet manufacturer; use a noncorrosive rosin flux over tinned surfaces.
- B. Stainless Steel Welding Rods:
 1. Type recommended in writing by stainless-steel sheet manufacturer for type of metal sheets furnished
- C. Fasteners:
 1. Same material as sheet metal or other non-corrosive metal as recommended by sheet metal manufacturer, unless otherwise indicated on the drawings.
 - a. Match finish of exposed heads with material being fastened.
- D. Electrolytic Insulation:
 1. Asphalt Mastic:
 - a. SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.
 2. Other electrolytic insulation materials:
 - a. Asphalt impregnated felt, neoprene or EPDM rubber.
- E. Sealants shall be in accordance with Specification Section - SEALANTS.
 1. Mastic Sealant:
 - a. Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
 2. Elastomeric Sealant:
 - a. Generic type recommended by sheet metal manufacturer and fabricator of components being sealed.
 3. Epoxy seam sealer:
 - a. 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.
- F. Adhesives:
 1. Type recommended by sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of sheet metal.
- G. Metal Accessories:
 1. Provide sheet metal clips, straps, anchoring devices, screens, mesh, and similar accessory units as required for installation of work, matching or compatible with material being installed; noncorrosive; size and thickness matching material being installed.
- H. Roofing Cement:
 1. ASTM D 4586 "Specification for Asphalt Roofing Cement, Asbestos Free," Type I.
 - a. Verify with roofing material utilized for this project as being compatible with materials and roofing manufacturer's warranty requirements.
- I. Gutter Sealing System (when applicable):
 1. Primer:
 - a. Suitable for metal gutter metal type and compatible with Coatings and Fabrics.

2. Base, Intermediate and Finish Layer Coating:
3. Base Layer Fabric: Polyester Fabric compatible with primer and coatings.
- J. Penetration Flashing:
 1. Self-Adhered and self-healing weather barrier strips, in accordance with FS UU-B-790a, Grade A.
 - a. 40 mil. minimum thickness, in 9 inch and 12 inch widths as is appropriate for the barrier application.

2.5 FABRICATION

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
 1. Comply with details shown to fabricate sheet metal that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 2. Form exposed sheet metal work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
 3. Seams:
 - a. Fabricate nonmoving seams in sheet metal with "Drive Cleat" or "Lock" seams.
 4. Expansion Provisions:
 - a. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches of corner or intersection.
 - b. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
 - c. Gutter Expansion control and design, unless otherwise indicated on the drawings:
 - 1) Ends of a gutter shall occur no more than fifty (50) feet apart with at least one downspout in between, and gapped in accordance with Chapter 1, Table 1-7.
 - 2) Adjacent ends shall be telescoped or enclosed with covers in a manner to accommodate expansion as indicated in Chapter 1, Fig. 1-5 to 1-7 and 1-10.
 5. Sealed Joints:
 - a. Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 6. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.
 7. Conceal fasteners and expansion provisions where possible.
 - a. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
 8. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
 - a. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.6 FINISHES

- A. Shop Finishing:
 1. All exterior galvanized sheet metal, unless specified otherwise, shall have all surfaces, except surfaces receiving roofing felt, properly cleaned and prepared and then painted with one coat Galvanized Metal Primer prior to installation.

- a. Galvanized Metal Primer: 4020PF "DEVGUARD," or approved equivalent.
- b. Galvanized repair paint: High-Zinc-Dust-Content, in accordance with SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight paint for re-galvanizing welds and repair painting galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of conditions:

1. Prior to the execution of the work under this specification section, inspect the installed work executed under other specification sections of this Project Manual which affect the execution of work under this specification section.
2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Coordination:

1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.

B. Protection:

1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.

C. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.
3. Prime substrates as required by manufacturer's written instructions and recommendations.

3.3 INSTALLATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
2. In accordance with approved submittals.
3. In accordance with Regulatory Requirements.
4. Set plumb, level, and square.
5. Structurally reinforce and anchor work as required.
6. Work shall be weather and water tight as required.
7. Where dissimilar metals come into surface contact, cover surface in contact with electrolytic insulation.
8. Immediately following installation, and prior to roofing application, the metal will be primed with a quick drying primer compatible with roofing system installed and in compliance with roofing manufacturer's warranty requirements.

B. Layout:

1. Lines shall be straight and true.
2. Field mitered joints shall be neat, true to line, and water tight.
3. Fastening: In accordance with approved shop drawings.
4. Sealants: Seal all joints with sealant.

C. Assistance:

1. Installation shall be in direct consultation and review of roofing system manufacturer where applicable.
- D. Penetration Flashing:
 1. Apply Penetration Flashing in conjunction with Water Barriers, Metal Accessories and all other related work.
 2. Install Penetration Flashing at all openings and penetrations at all exterior walls and at interior walls considered to be "Semi-Wet" and "Wet" exposures (i.e., Toilets, Showers, Lockers, Kitchens, etc.).
 3. Install Penetration Flashings with Water Barriers, Metal Accessories and all other related work in "shingle" or "weatherboard" fashion.
 4. Penetration Flashings shall be installed as required in CBC Sections 1404.4 in 9" widths and continuous to 9" past all intersections around all openings, penetrations and termination of Sheet Metal Systems.
 - a. Should any penetration warrant a greater width of wall flashing, provide 12" wide flashing as required.
 - b. When an object extends through the Sheet Metal System, return the edge of the Penetration Flashing 1" and apply to the sides of the penetrating item.
 5. Objects such as electrical back-boxes, electrical speaker enclosures, penetrations created by structural members, and the like.

3.4 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
 1. Clean any soiled surfaces immediately.
 2. Finish shall be clean and ready for the application of any additional finishes.

3.5 SCHEDULES

- A. Architectural Sheet Metal Items: Items visible from the interior occupied spaces and from all exterior viewing positions. Fabrication of all Architectural Items shall provide a fully finished appearance on all visible surfaces. Fabrication shall be soldered or welded joints and ground smooth. Solid flat head riveted joints may be used if necessary, but limited in use and must be indicated on the shop drawings by the fabricator, and accepted by the Architect. The use of sheet metal screws, pop rivets, or bolts are not be permitted. All joints between section shall be uniformly gapped with a maximum of 1/16" and splice backing shall be centered on the joint.
- B. Utility Sheet Metal Items: Items not visible from the interior occupied spaces nor from exterior viewing positions. Fabrication of all Utility Items shall be in accordance with SMACNA Standards and shop practices.
- C. Sheet Metal Schedules are not considered as a complete list. Refer to Drawings for locations of all conditions requiring sheet metal items.
- D. Multiple types of material are specified for various items in the Schedules. Verify with roofing manufacturer as to which material shall be used to be compatible to the roofing material provided and to satisfy roofing warranty requirements.
- E. Materials gauges specified for Items in the Schedules are minimum and shall be provided unless otherwise noted on the Drawings.
- F. Schedule's Remarks / SMACNA No., 6th Edition, and are references of the standards for fabrication. Refer to Drawings for configurations and other fabrication requirements of sheet metal items.

G. Architectural Sheet Metal Items

ARCHITECTURAL SHEET METAL ITEMS					
ITEM	LOCATIO N	MAT.	GA.	FINISH	REMARKS / SMACNA NO., 6th Edition
Parapet Cap	Parapet Walls	Steel	20	Shop	Chapter 3, similar to Fig. 3-4A or Fig. 3-4G with E-1 and E-4 edge styles, as indicated on drawings. Provide J9 "Drive Cleat" joints, typical.
Cap Coping	Parapet Walls	Steel	20	Shop	Chapter 3, similar to Fig. 3-4G with E-4 edge style, as indicated on drawings. Provide J9 "Drive Cleat" joints, typical.
Drip Flashing	Various Conditions	Steel	22	Shop	Chapter 4, minimum 4" under finish and minimum 4" cover. Provide J2 "Butt & Backup Plate" joints with 1/16" gap. Fabricate Transition pieces and End Caps.
Counter Flashing	Various Conditions	Steel	22	Shop	Chapter 4, minimum 4" under finish and minimum 4" cover with 3/4" hemmed drip. Provide J2 "Butt & Backup Plate" joints with 1/16" gap. Fabricate Transition pieces and End Caps.
Opening Heads, Jambs & Sill Flashing	Metal Frames	Steel	22	Shop	Weld and Grind smooth all joints
Opening Heads, Jambs & Sill Flashing	Aluminum Windows	Alum	0.0253	Match Aluminum Window Finish.	Seal all joints.
Opening Heads, Jambs & Sill Flashing	Storefront	Alum	0.0253	Match Storefront Finish.	Seal all joints.
Opening Heads, Jambs & Sill Flashing	Curtain Wall	Alum	0.0253	Match Curtain Wall Finish.	Seal all joints.
Wall Penetration Flashing	Exterior Wall	Steel	22	Shop	Similar to Chapter 6, Figures 6-36, 37, 38 & 39.
Scuppers	Parapet Wall	Steel	22	Shop	Chapter 1, similar to Fig. 1-26A-B or 1-30A-B.
Gutters	Exterior	Steel	18	Shop	Chapter 1, Fig. 1-1. Provide expansion joints similar to Fig. 1-7. Solder overflow and downspout outlets.
Gutters	Concealed	Stainless Steel	18	Shop	Chapter 1, Fig. 1-1. Provide expansion joints similar to Fig. 1-7. Solder overflow and downspout outlets. Continuous welds.
Conductor Head	Exterior	Steel	18	Shop	Chapter 1, similar to Fig. 1-25. Solder downspout outlet.
Down Spouts	Exterior	Steel	18	Shop	Chapter 1, similar to Fig. 1-31, 1-32A or B. Provide Fig. 1-35B or J hangers.
Fascia Panels	Exterior	Steel	18	Shop	Weld and grind smooth all joints.
Color Band Panels	Exterior	Steel	18	Shop	Weld and grind smooth all joints.
Serving Counter	Serving Counter	S.S.	16	#4	Weld and Grind smooth all joints

ARCHITECTURAL SHEET METAL ITEMS					
ITEM	LOCATION	MAT.	GA.	FINISH	REMARKS / SMACNA NO., 6 th Edition
Work Counter	Work Counter	Steel	16	Shop	Weld and Grind smooth all joints
Fabricated Tilt Mirror	Student Restrooms	S.S.	16	#4	Weld and grind smooth all joints.

H. Utility Sheet Metal Items

UTILITY SHEET METAL ITEMS					
ITEM	LOCATION	MAT.	GA.	FINISH	REMARKS / SMACNA NO., 6 th Edition
Clips & Cleats	Various Conditions	Steel	22	Shop	
Parapet Boot Flashing	Parapet Cap & Cap Coping	Steel	18	Shop	Solder all joints. Minimum 4" under finish and min. 4" cover.
Counter Flashing	Various Conditions	Steel	22	Shop	Minimum 4" under finish and min. 4" cover with $\frac{3}{4}$ " hemmed drip. Provide J2 "Butt & Backup Plate" joints with 1/16" gap. Fabricate Transition pieces and End Caps.
Reglet & Counter Flashing	Plaster Parapets	Steel	24	Shop	FRY Spring Lock Type "ST" with "Spring-Loc" Flashing. Preformed transition pieces and end caps.
Reglet & Counter Flashing	Plaster Parapets	Steel	24	Shop	FRY Spring Lock Type "STX" with "Spring-Loc" Flashing. Preformed transition pieces and end caps.
Reglet & Counter Flashing	Masonry Parapet	Steel	24	Shop	FRY Spring Lock Type "MA" with "Spring-Loc" Flashing. Preformed transition pieces and end caps.
Reglet & Counter Flashing	Masonry Parapet	Steel	24	Shop	FRY Spring Lock Type "SM" with "Spring-Loc" Flashing. Preformed transition pieces and end caps.
Structural Support Flashing	Roof Penetration	Steel	18	Shop	Chapter 4, Similar to Figures 16A or B or C if welded or soldered, and grind smooth.
Vent Pipe Flashing	Roof Penetration	Lead or Steel	4#/sf or 22	Shop	Chapter 4, Fig. 4-15B.
Pipe or Conduit Flashing	Roof Penetration	Lead or Steel	4#/sf or 22	Shop	Chapter 4, similar to Figure 4-15C.
Multiple Pipe or Conduit Flashing	Roof Penetration	Lead or Steel	4#/sf or 22	Shop Or Shop	Chapter 4, similar to Figure 4-15A or 4-15B.
Insulated Pipe Flashing	Roof Penetration	Lead or Steel	4#/sf or 22	Shop	Chapter 4, Similar to Fig. 4-15C. Refer to Plumbing.
Mechanical Flue Pipe Flashing	Roof Penetration	Lead or Steel	4#/sf or 22	Shop	Chapter 4, Similar to Fig. 4-15C. Refer to Plumbing.
Manufactured Curb Flashing	Roof Penetration	Steel.	22	Shop	Provide formed metal corners lapped 6" with sheet metal screws with neoprene washers at 18" o.c.
Hatch Flashing	Roof Penetration	Steel.	22	Shop	Provide formed metal corners lapped 6" with sheet metal screws with neoprene washers at 18" o.c.
Ventilating Units Flashing	Roof Penetration	Steel.	22	Shop	Provide formed metal corners lapped 6" with sheet metal screws with neoprene washers at 18" o.c.
Scuppers	Parapet Screens	Steel.	22	Shop	Chapter 1, similar to Fig. 1-26A-B or 1-30A-B.
Roof Splash Pans	Roof	Steel.	22	Shop	Chapter 1, Fig. 1-36, 2-rib corrugation section..
Valley Flashing	Metal Panel Roof	Steel.	22	Shop	Chapter 6, Similar to Fig. 6-6 or Fig. 1-21 or Fig. 1-23, Detail 10, or Fig. 6-9, Detail 7 and Chapter 4, Fig. 4-10.
Built-in Gutter	Metal Panel	S.S.	16	Shop	Chapter 1, similar to Fig. 1-4 or Fig. 1-21 or

UTILITY SHEET METAL ITEMS					
ITEM	LOCATION	MAT.	GA.	FINISH	REMARKS / SMACNA NO., 6 th Edition
	Roof				Fig. 1-23. Provide expansion joint similar to Fig. 1-8. Weld and grind smooth all joints.
Louver Screens	Louvered Openings	Steel.	14	Shop	Chapter 7, Fig. 7-7A or B. Provide 12 gauge (0.105) 3 x 3 welded wire mesh.
Plumbing Sheet Metal	Various Plumbing Conditions	Steel.	22	Shop	Refer to Plumbing Drawings and Specifications.
Mechanical Sheet Metal	Various Mechanical Conditions	Steel.	22	Shop	Refer to Mechanical Drawings and Specifications.
Electrical Sheet Metal	Various Electrical Conditions	Steel.	22	Shop	Refer to Electrical Drawings and Specifications.
Roof and Overflow Drain Pans	Roof	Lead	#4	Shop	See Details.
Mechanical, Large Flue Flashing	Roof Penetration	Steel	22	Shop	Chapter 4, Detail 4-14A.

END OF SECTION

SECTION 07 72 00 – ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all roof accessory materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 05 12 00 STEEL AND FABRICATIONS
 - 4. 06 10 00 ROUGH CARPENTRY
 - 5. 07 60 00 SHEET METAL
 - 6. 07 92 00 SEALANTS
 - 7. 09 22 16 METAL FRAMING
 - 8. 09 91 00 PAINTING
 - 9. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. ASTM American Society for Testing and Materials
 - b. LIA Lead Industries Association.
 - c. NRCA National Roofing Contractors Association (If the roofing system scheduled to be installed calls for related sheet metal flashing to be in accordance with NRCA detailing in order to satisfy their warranty requirements, then the NRCA detailing shall govern in lieu of SMACNA standards.)
 - d. OSHA Occupational Safety and Health Administration
 - e. SMACNA Sheet Metal and Air Conditioning Contractor's National Association, latest Edition, Architectural Sheet Metal Manual.

1.3 SYSTEM DESCRIPTION

- A. (Manufactured Curbs Only) This section specifies curbs for mechanical and electrical equipment specified in Division 23 and Division 26, as well as architectural curbs in Division 05, Division 07 and Division 08. These curbs are designed and fabricated as welded single piece units that are structurally designed by the manufacturer to span structural framing. The curbs require structural calculations from the manufacturer in accordance with the CBC for the mechanical or electrical units supplied that are mounted on top of the curbs.
 - 1. Manufactured curbs shall be designed, engineered, and fabricated for exact mechanical units selected after bid, and can be designed for compound slopes and difficult roofing conditions. Designs shall accommodate each type of roofing condition.
 - 2. All curbs shall be designed to be a minimum of 8-inches above the finished roof at the top most portion of the curb, and designed with crickets for watertight connections.
 - 3. Construct curbs to match roof slopes with plumb and level top surfaces for mounting mechanical or electrical equipment.

1.4 SUBMITTALS

A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:

1. Coordination Drawings (Manufactured Curbs only):
 - a. Manufacturer(s) shall coordinate with the Contractor and the Roofing Subcontractor all applicable work placed on or penetrating the roof deck and roof membrane system for the proper selection of Roof Accessories for this project. Manufacturer shall coordinate with the Contractor all weights and dimensions from approved shop drawings of mechanical equipment and piping/conduit required for this project and fabricate accordingly. All items coordinated (including Structural Calculations) shall be presented within the shop drawings for the Architect's and Structural Engineer of Record's review.
2. Product Data.
 - a. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.
 - b. Submit manufacturer's standard color range for selection by the Architect.
3. Shop Drawings.
 - a. Submit shop drawings prepared by, or under the supervision of a registered Civil or Structural Engineer in the State of California, detailing fabrication and assembly of the work under this section, as well as procedures and diagrams. Include setting drawings, templates, and directions for installation of anchor bolts and other anchorage to be installed as unit of work of other related sections.
 - 1) Manufactured Curbs must be coordinated with the Structural Shop Drawings and Mechanical / Electrical Equipment supplied as to size and weights for any roof top installation.
4. Quality Assurance/Control Submittals:
 - a. Manufacturer's Written Instructions:
 - 1) Manufacturer's written instructions.
5. Closeout Submittals in accordance with the following:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Operation Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - c. Record Documents in accordance with Specification Section - RECORD DOCUMENTS.
 - d. Warranty in accordance with Specification Section - WARRANTIES.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
2. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.

B. In accordance with Specification Section - REGULATORY REQUIREMENTS.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing, shipping, handling, and unloading:

1. Products shall be individually wrapped.
2. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.

- B. Acceptance at Site:
 - 1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
 - 2. Damaged products will not be accepted.
- C. Storage and protection:
 - 1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.
 - a. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.

1.7 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 - 1. Hatch Railing System shall provide a warranty against defects in material and workmanship:
 - a. Warranty Period Five (5) Years.
 - 1) From the Date of Substantial Completion.
- C. Installer's Warranty:
 - 1. Weather Tightness Warranty for Roof Accessories: Manufacturer's Standard form in which manufacturer agrees to repair or replace Roof Accessory assemblies that fail to remain weathertight, including leaks within specified warranty period. Warranty shall guarantee manufactured Roof Accessories to be free from defects in materials or workmanship.
 - a. Warranty Period Five (5) Years.
 - 1) From the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MANUFACTURED CURBS

- A. General:
 - 1. Curbs shall be constructed to match roof slope of roof and provide a level top surface for mounting of mechanical equipment.
 - a. Minimum height of all curbs shall be 8 inches above finished roof per NRCA requirements.
- B. Equipment Curbs:
 - 1. Manufacturer: ROOF PRODUCTS, INC.
 - a. Model Number:
 - 1) Membrane Roof: RPC-5.
 - 2) Metal Roof: RPMB-5.

- b. Acceptable alternative manufacturer: ROOF PRODUCTS & SYSTEMS CORP.
 - 2. Factory installed pressure treated wood nailers.
 - 3. Welded 18-gauge minimum galvanized steel shell and base plate, as applicable to roof equipment situation, with continuous mitered and welded corner seams.
 - 4. 3 lb. density rigid fiberglass insulation board.
 - 5. Internal angle reinforcing (1" x 1" x 12 gauge) on sides greater than 36 inches in length, spaced 24 inches o.c.
 - 6. All welds to be coated with manufacturer's "Alumanation 100."
 - 7. Internal curb duct supports as required for the type of Mechanical units selected for the project.
- C. Equipment Platform:
 - 1. Manufacturer: ROOF PRODUCTS, INC.
 - a. Model Number:
 - 1) Membrane Roof: RPPF-5.
 - 2) Metal Roof: RPMB-5.
 - b. Acceptable alternative manufacturer: ROOF PRODUCTS & SYSTEMS CORP.
 - 2. Factory installed pressure treated wood nailers.
 - 3. Welded 18 gauge minimum galvanized steel shell and base plate, as applicable to roof equipment situation, with continuous mitered and welded corner seams.
 - 4. 3 lb. density rigid fiberglass insulation board.
 - 5. Internal angle reinforcing (1" x 1" x 12 gauge) on sides greater than 36 inches in length, spaced 24 inches o.c.
 - 6. All welds to be coated with manufacturer's "Alumanation 100."
 - 7. Internal curb duct supports as required for the type of Mechanical units selected for the project.
 - 8. Platform Cover:
 - a. Welded 18 gauge galvanized steel construction.
 - b. Cover cross broken for positive water run-off.
 - c. Flared drip edge.
 - d. Flat Lock and Soldered seams on covers 43 inches x 105 inches and larger.
 - 9. Platform: Provide 1-1/8" thick fire-retardant treated T & G plywood top sheathing
 - 10. Vapor Retarder: Two layers of 15lb building paper between plywood platform and curb cover.
- D. Equipment Supports:
 - 1. Manufacturer: ROOF PRODUCTS, INC.
 - a. Model Number:
 - 1) Membrane Roof: RPES-3.
 - b. Acceptable alternative manufacturer: ROOF PRODUCTS & SYSTEMS CORP.
 - 2. 18-gauge minimum galvanized steel shell, base plate and counterflashing.
 - 3. Factory installed pressure treated wood nailer.
 - 4. Internal bulkhead re-enforcement.
 - 5. All welded construction.
 - 6. Vapor Retarder: Two layers of 15lb building paper between wood nailer and counterflashing.
- E. Accessories:
 - 1. Square to Round adapter as indicated on the drawings:
 - a. Cross broken for positive run-off.
 - b. Type WG 16-gauge galvanized steel construction.
 - c. Watertight construction.
 - d. Insulated to prevent condensation.
 - 2. "Decktite" roof pipe boots in size and number applicable to the size of pipes penetrating the equipment platform indicated in the Contract Documents.

3. Fasteners as required by the manufacturer for the proper installation of the roof curbs and weather resistant coating as standard with the manufacturer.
4. Neoprene strips, sheets or washers as required by the manufacturer for weathertight construction.
5. Provide Isolation Rails as required by Mechanical in DIV. 23 or Electrical in DIV. 26.

2.3 SMOKE VENTS

A. Double Leaf Fire Vent:

1. Manufacturer: BILCO COMPANY.
 - a. Model Number: ACDSH - Automatic Smoke Vent.
 - b. Acceptable alternative manufacturer: BABCOCK DAVIS HATCHWAYS, INC.
2. Size: 48 inch x 96 inch.
3. Performance:
 - a. Vents: UL/FM Approved.
 - b. Sound Rating: STC-50 and OITC 46.
 - 1) ISO 140-18 Rainfall Sound Rating – 37.5 db.
4. Cover:
 - a. Material: 14 gauge paint bond G-90 galvanized steel.
 - b. Insulation: 4 inch thick mineral wool.
 - c. Liner: 12 gauge galvanized steel.
 - d. Flange: 5-3/4 inch beaded.
5. Curb:
 - a. Material: 10 gauge paint bond G-90 galvanized steel.
 - b. Insulation: 4-inch-thick mineral wool.
 - c. Height: Minimum height 12 inches to allow for 8 inches of vertical flashing above the finished roof. Custom heights available.
 - d. Flange: 6-7/8 inches.
 - e. Cap Flashing: 14-gauge galvanized steel, fully welded at corners.
6. Hardware:
 - a. Material: Zinc plated/chromate sealed.
 - b. Hinges: Heavy pintle.
 - c. Operators: Heavy duty compression springs fully enclosed in telescopic tubes capable of opening against 10 pound per square foot live load.
 - d. Latch Release:
 - 1) Manually operated from inside only.
 - 2) To resist opening against 30 pounds per square foot uplift pressure.
 - 3) Reset automatically upon closing cover.
 - e. Automatic Opener:
 - 1) Activate with a re-settable electric actuator to release when the latch mechanism is energized by an electric signal from the smoke detection system. (Voltage shall match system voltage. See Division 26. Manufacturer offers 115VAC, 24VAC or 24VDC.) Verify with manufacturer whether a Fusible Link is needed with this system.
 - 2) Automatic locking in open position. Reset switch shall unlock and close door when alarm has discontinued.
 - f. Shock Absorber: Heavy duty.
 - g. Cover Seal: Dual EPDM, permanently adhered to the underside.
 - h. Test Rigging:
 - 1) In accordance with California State Fire Marshal's requirements.
 - 2) Operational from the floor at location indicated on the Drawings.
 - 3) Cables, pulleys and wall mounted enclosed winch.
 - 4) Test Rigging diagram subject to Architect's approval.
 - 5) Doors of all smoke vents must be interconnected to open simultaneously.

7. Finish: Alkyd base red oxide primer.
 - a. Color: As selected from a full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual which affect the execution of work under this specification section.
 2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Coordination:
 1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
- B. Protection:
 1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.
- C. Surface Preparation:
 1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
 2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.

3.3 INSTALLATION

- A. General:
 1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
 - a. Provide Hatch Railing System on all hatches or fire vents within ten (10) feet of any roof edge) and install in accordance with manufacturer's written instructions.
 2. In accordance with approved submittals.
 3. In accordance with Regulatory Requirements.
 4. Set plumb, level, and square.
 5. Damaged products shall not be installed.
- B. Layout:
 1. Lines shall be straight and true.

3.4 FIELD QUALITY CONTROL

- A. Site Tests:
 1. As required by Regulatory Requirements.
- B. Inspection:
 1. As required by Regulatory Requirements.
 2. Schedule inspections and notify the Architect, Project Inspector and any other regulatory agencies of the time at least 48 hours prior to the inspection.
 3. No work shall be without the inspections required by Regulatory Requirements.

3.5 ADJUSTING

- A. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

3.6 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
 - 1. Clean any soiled surfaces immediately.
 - 2. Finish shall be clean and ready for the application of any additional finishes.
 - 3. In accordance with manufacturer's written instructions and recommendations.

END OF SECTION

SECTION 07 92 00 – SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all joint sealant materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. SPECIFICATION SECTIONS IN THE FACILITY CONSTRUCTION SUBGROUP.
 - 4. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 5. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements: It is the intention of this specification section and the drawings to form a guide for a complete and operable system. Any items not specifically noted but necessary for a complete and operable system shall be provided under this section.
 - 1. Provide elastomeric sealants for exterior applications that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
 - 2. Provide sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water-resistant and cause no staining or deterioration of joint substrates.

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product data from manufacturers for each joint sealant product required.
 - 2. Shop drawings:
 - a. Provide full details of all sealants and accessories proposed for use for approval by the Architect. All materials and products proposed shall be compatible with each other and with the substrates and adjacent wall colors, and shall be non-staining and non-bleeding. Submit an affidavit from the manufacturer confirming the acceptance of the use of the selected products in the manner and on the substrates proposed.
 - 3. Samples.
 - a. Samples for initial selection purposes in form of manufacturer's bead samples, consisting of strips of actual products showing full range of colors (standard, premium and custom) available, for each product exposed to view.
 - 1) Provide color chips of adjacent wall surface colors; to be used in evaluating the sealant color samples.
 - 4. Quality Assurance/Control Submittals:
 - a. Provide UL Assembly Classification appropriate for each fire rated penetration.
 - b. Certificates:
 - 1) Submit three (3) copies of certificates.

- a) Certification by each joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.
- b) Certified test reports for elastomeric sealants on aged performance as specified, including hardness stain resistance, adhesion, cohesion or tensile strength, elongation, low temperature flexibility, compression set, modulus of elasticity, water absorption, and resistance (aging, weight loss, deterioration) and heat and exposure to ozone and ultra violet light. Adhesion data shall include long-term adhesion characteristics of all adhesion surfaces including silicone, aluminum and glass coatings and long term weathering test on the silicone on contact with similar materials.
- c) Certificate of Installation: Signed by the installer and sealant manufacturer stating that sealant installed complies with specifications, and that installation methods comply with manufacturer's printed instructions for each condition of installation and use on the project. The sealant installer shall have no less than five years of continuous experience in installing the specified products. Their experience shall include similar work to this subject project. In addition, the manufacturers will provide written approval of the material installers.
- c. Manufacturer's Written Instructions:
 - 1) Submit three (3) copies of manufacturer's written instruction
- d. Closeout Submittals in accordance with Specification Sections in Division One:
- e. Warranty in accordance with Specification Section - WARRANTIES.

1.4 QUALITY ASSURANCE

A. Qualifications:

- 1. Material Qualifications:
 - a. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.
- 2. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
- 3. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units and colors without causing delay in the work.

B. Regulatory Requirements:

- 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. AAMA American Architectural Manufacturer's Association
 - 1) AAMA 800-92 - "VOLUNTARY SPECIFICATIONS AND TEST METHODS FOR SEALANTS.
 - b. ASTM American Society for Testing and Materials.
 - 1) ASTM C 1193 - "STANDARD GUIDE FOR USE OF JOINT SEALANTS."
 - c. CA-CHPS California High Performance Schools
 - d. GANA Glass Association of North America, 1997 Edition of the Glazing Manual, and the most recent Edition of the Sealant Manual.
 - e. SCAQMD South Coast Air Quality Management District, Rule 1168.
 - f. SWRI Sealant Waterproofing Restoration Institute - Types of standards as found in Chapter III "Sealants: The Professionals' Guide."

C. Meetings:

1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with all other related work.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
 1. Comply with the Sealant Requirements of the GANA Glazing Manual and GANA Sealant Manual.
- B. Store and handle materials in compliance with manufacturer's written recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
 1. Store sealant containers in a protected location in accordance with their manufacturer's printed instructions until their use.

1.6 PROJECT CONDITIONS

- A. Environmental requirements:
 1. Apply materials within manufacturer's written recommended surface and ambient temperature ranges.
 2. Apply materials when working joints are most likely to be normal size.
 3. Do not install sealants under adverse weather conditions, or when temperatures are beyond manufacturer's written recommended limits.
 - a. Proceed with the installation only when forecasted weather conditions are favorable for proper sealant cure, and development of early bond strength. Allow a minimum of three days after rain.
 - b. Where joint width is affected by ambient temperature variations, install sealants only when temperatures are in the lower third of manufacturer's written recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at low temperatures.

1.7 WARRANTY

- A. Contractor's General Warranty:
 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 1. In accordance with Specification Section - WARRANTIES.
 2. Manufacturer shall warrant exterior joint sealant after substantial completion of work.
 - a. Warranty Period Ten (10) Years.
- C. Installer's Warranty:
 1. Sealant Contractor shall warrant sealants against defective materials and workmanship after substantial completion of work.

- a. Warranty Period Five (5) Years.
- b. Warranty shall further state that installed sealants are warranted against the following:
 - 1) Water leakage through sealed joints.
 - 2) Adhesive or cohesive failure of sealant.
 - 3) Staining of adjacent surfaces caused by migration of primer or sealant.
 - 4) Chalking or visible color change of the cured materials.
- c. The installer shall make repairs during the warranty period at no cost to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.

- 1. Specified product manufacturer, or approved equivalent:

- a. One-Part Neutral Cure Silicone Sealant:
 - 1) PECORA "#890"
 - a) NOTE: For continual immersion in water conditions, provide PECORA "Dynatred".
 - b) If the water contains a chlorine content of 5ppm, then PECORA "Synthacalk GC2+" shall be used.
 - 2) Acceptable alternative manufacturers for 1) only above:
 - a) BONDAFLEX "Sil 290"
 - b) DOW PERFORMANCE SILICONES "#790"
 - c) SONNEBORN "Sonolastic 150" or "Sonolastic 150 VLM"
- b. One-Part Acid-Curing Silicone Sealant:
 - 1) PECORA "#860"
 - 2) Acceptable alternative manufacturers:
 - a) BONDAFLEX "Sil 100 GP"
 - b) DOW PERFORMANCE SILICONES "#999-A"
 - c) SONNEBORN "Omniplus"
- c. One-Part Mildew-Resistant Silicone Sealant:
 - 1) PECORA:
 - a) White Color Only "#345"
 - b) Available in multiple colors for selection "#898"
 - 2) Acceptable alternative manufacturers to 1), a), above:
 - a) BONDAFLEX "Sil 100 WF"
 - b) DOW PERFORMANCE SILICONES "#786"
 - c) SONNEBORN "Omniplus"
- d. One-Part Gun Grade Urethane Sealant:
 - 1) PECORA "Dynatrol I-XL"
 - 2) Acceptable alternative manufacturers:
 - a) BONDAFLEX "Pur 25" or "Pur 25 Tex"
 - b) SIKA "Sikaflex 1a" or "Sika Textured"
 - c) SONNEBORN "NP1 Smooth" or "X1 Textured"
 - d) VULKEM "#116"
- e. Multi-Component Gun Grade Urethane Sealant:

- 1) PECORA "Dynatred"
- 2) Acceptable alternative manufacturers:
 - a) BONDAFLEX "Pur 2 NS"
 - b) SIKA "Sikaflex 2c NS"
 - c) SONNEBORN "NP2"
- f. Multi-Component Gun Grade Urethane Sealant (Fast Curing):
 - 1) PECORA "Dynatred"
 - 2) Acceptable alternative manufacturers:
 - a) BONDAFLEX "Pur 2 NS"
 - b) SIKA "Sikaflex 2c NS"
 - c) SONNEBORN "NP2" with manufacturer's accelerator.
 - d) VULKEM "#227"
- g. One-Part or Multi-Component Gun Grade Urethane Sealant (Security Sealant) :
 - 1) PECORA "Dynaflex"
 - 2) Acceptable alternative manufacturers:
 - a) BONDAFLEX "Pur 2 NS"
 - b) SIKA "Sikaflex 2c NS TG"
 - c) SONNEBORN "Ultra"
- h. One-Part Pourable Self-Leveling Urethane Sealant:
 - 1) PECORA "Urexpan NR-201" or "Dynatred"
 - 2) Acceptable alternative manufacturers:
 - a) BONDAFLEX "Pur 35 SL"
 - b) SIKA "Sikaflex 1c SL"
 - c) SONNEBORN "Sonolastic SL 1"
 - d) VULKEM "#45"
- i. Multi-Component Pourable Self-Leveling Urethane Sealant (Fast Curing):
 - 1) PECORA "Urexpan NR-200"
 - 2) Acceptable alternative manufacturers:
 - a) BONDAFLEX "Pur 2 SL"
 - b) SIKA "Sikaflex 2c SL"
 - c) SONNEBORN "Sonolastic SL 2"
 - d) VULKEM "#245/255"
- j. Acrylic-Emulsion Sealant:
 - 1) PECORA "AC-20"
 - 2) Acceptable alternative manufacturers:
 - a) BONDAFLEX "Sil-A 700"
 - b) SONNEBORN "Sonolac"
- k. One-Part Butyl Sealant:
 - 1) PECORA "BC-158"
 - 2) Acceptable alternative manufacturers:
 - a) PTI (by H.B. FULLER) "#707"
- l. Acoustical Sealant:
 - 1) PECORA:
 - a) Exposed and Fire Rated areas; Pecora "AC-20 FTR"
 - b) Concealed areas: Pecora "AIS-919"
 - 2) Acceptable alternative manufacturers:
 - a) BONDAFLEX "Sil-A 700"
 - b) OSI "GRABBER" #GSCS
 - c) TREMCO INC. 834
 - d) W.W. HENRY "#413"
- m. Firestop Sealants: Use in designated Fire-Rated Assemblies in accordance with approved UL Classified Assemblies.
 - 1) HILTI
 - 2) Acceptable alternative manufacturers:

- a) 3M
 - b) PECORA
 - n. Firestop Putty Pads: Use in Fire-Rated Assemblies where penetration holes are too large for caulk, in accordance with approved UL Classified assemblies:
 - 1) HEVI-DUTY / NELSON "Putty Pads"
 - o. Glazing Tape Sealants:
 - 1) Butyl Glazing Tape:
 - a) PECORA "Extru-Seal"
 - b) Acceptable alternative manufacturers:
 - c) TREMCO, INC. "440 Tape"
 - 2) Butyl Pressure Glazing Tape:
 - a) PECORA "Dyna-Seal"
 - p. Pre-Compressed Foam Sealants:
 - 1) EMSEAL CORP. "Emseal"
 - q. Sheet Caulking (Electrical Junction Box Sealers):
 - 1) LOWRY "Electrical Box Sealer"
 - 2) Acceptable alternative manufacturer:
 - a) TREMCO INC. "Sheet Caulking"
 - r. EIFS preformed paintable Urethane Tape:
 - 1) SIKA "Sikaflex PUR" Tape System
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. General:
 - 1. Compatibility: Provide sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - a. Colors: Provide color of exposed sealants to comply with the following:
 - 1) Sealant colors shall match adjacent wall color.
 - 2) Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.
- B. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants (Silicones, Urethanes, and Acrylics) that comply with ASTM C 920 "Specification for Elastomeric Joint Sealants," and other requirements indicated on each Elastomeric Joint Sealant listed, including those requirements referencing ASTM C 920 "Specification for Elastomeric Joint Sealants," classifications for Type, Grade, Class, and Uses.
 - 1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant listed, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719 "Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)," to withstand the specified percentage change in the joint width existing at time of installation.
- C. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 "Specification for Latex Sealants," that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
- D. Butyl Sealant: Manufacturer's standard one-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1311 "Standard Specification for Solvent Release Sealants," and formulated with minimum of 75 percent solids to be nonstaining, paintable, and have a tack-free time of 24 hours or less.

- E. Acoustical Sealant: Manufacturer's non-drying, non-bleeding and non-hardening butyl sealant complying with ASTM C 834 "Specification for Latex Sealants," and the following requirements:
 - 1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90 "Test method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements."
 - 2. For fire rated conditions, use an acoustical sealant that has at least Class II Flame Spread and Smoke Developed ratings in accordance with ASTM E-84 "Test method for Surface Burning Characteristics of Building Materials," as follows:
 - a. Flame Spread Rating 53.
 - b. Smoke Developed Rating 117.
- F. Firestop Pillows / Bags: In accordance with UL Classified systems. Reusable, heat-expanding pillows / bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- G. Firestop Sealants: In accordance with ASTM E 814 "Specification for Latex Sealants," and ANSI/UL 1479 Classified systems.
 - 1. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 2. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.3 ACCESSORIES

- A. Tape: Manufacturer's standard, solvent-free, butyl-based tape sealant with a solids content of 100 percent formulated to be nonstaining, paintable, and nonmigrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with a release paper on one side.
- B. Pre-compressed Foam: Manufacturer's standard preformed, pre-compressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in pre-compressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:
 - 1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, and compatible with joint substrates and other sealants.
 - 2. Impregnating Agent: Manufacturer's standard.
 - 3. Density: Manufacturer's standard.
 - 4. Backing: Pressure-sensitive adhesive factory applied to one side with protective wrapping.
- C. Backing Rods (Joint Sealant Backing):
 - 1. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 2. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - a. Open-cell polyurethane foam.
 - b. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
 - c. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
 - d. Any material indicated above.

3. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
 4. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.
 5. Acoustical Sheet Caulking for junction boxes: LOWRY'S Electrical Box Sealer, or TREMCO INC. sheet caulking
- D. Miscellaneous Materials:
1. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
 2. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
 3. Masking Tape: Non-staining, nonabsorbent material compatible with sealants and surfaces adjacent to joints. Use the type of masking tapes available that is compatible to the substrate being masked without damaging the surface material of finish when removed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of conditions:

1. Prior to the execution of the work under this specification section, inspect the installed work executed under other specification sections of this Project Manual which, affect the execution of work under this specification section.
2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of sealants.

- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
1. Masking Tape: Use the appropriate masking tape (type selected to the substrate so as not to mar the surface it is protecting) where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. General:

1. Comply with joint sealant manufacturer's written installation instructions applicable to products and applications indicated, except where more stringent requirements apply. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 "Standard Guide for Use of Joint Sealants," for use of sealants as applicable to materials, applications, and conditions indicated.
 - a. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 "Practice for Use of Sealants in Acoustical Applications," as applicable to materials, applications, and conditions indicated.
 - b. Use Urethane Sealants at painted joints.
 - c. Use Silicone Sealants at exposed, non-painted joints.
 - d. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1) Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability
 - a) Do not leave gaps between ends of joint fillers.
 - b) Do not stretch, twist, puncture, or tear joint fillers.
 - c) Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 - 2) Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
 - e. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
 - 1) For normal moving joints not subject to traffic: Fill joints to a depth equal to 50% of joint width, but not less than 1/4" deep or more than 1/2" deep. In no case shall the applied sealant width exceed the sealant depth.
 - 2) Assure that the *bond line* surface is a minimum of 1/4" wide. Install approved backer material at a proper depth to provide sealant bead profiles as detailed on approved shop drawings. Backer material shall be of appropriate size and shape and shall be compressed between 25% and 50% when installed.
 - 3) Backer material may not be modified in-lieu of using the properly dimensioned material. Install, when required a polyethylene, or other approved, bond backer tape to provide sealant bead profiles as detailed on approved shop drawings.
 - f. Do not allow sealants, primers, or other compounds to overflow, spill or migrate into voids of adjacent construction.

- g. Remove excess sealant spillage promptly as this work progresses. Clean adjacent surfaces by recommended means to remove sealant, but not damage the surfaces. Remove all cartons and debris from the site as the work progresses and at the end of each work day. Joints shall be prepared and sealed on the same working day.
- h. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1) Provide concave joint configuration per Figure 5A in ASTM C 1193 "Standard Guide for Use of Joint Sealants," unless otherwise indicated.
 - 2) Provide flush joint configuration, per Figure 5B in ASTM C 1193 "Standard Guide for Use of Joint Sealants," where indicated.
 - a) Use masking tape to protect adjacent surfaces of recessed and tooled joints.
 - 3) Provide recessed joint configuration, per Figure 5C in ASTM C 1193 "Standard Guide for Use of Joint Sealants," of recess depth and at locations indicated.
- i. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's written directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's written recommendations.
- j. Acoustical Sealant Applications:
 - 1) Provide acoustical sealant to form an airtight seal at all penetrations and perimeter of sound-rated partitions, floors and ceilings. Comply with requirements of specification section titled Gypsum Board. Use backer-rod where gaps to be sealed exceed 3/8 inches.
 - 2) Provide sheet caulking to seal the back and sides of all junction boxes (4 gang and smaller) recessed in acoustically-rated partitions.
 - 3) Provide acoustical sealant as a continuous bead along gypsum board face layer at all head and sill conditions of sound-rated partitions and around the perimeter of resilient ceilings.
- k. Firestop Sealants: In accordance with applicable UL Classified numbers compatible with products provided.

3.4 CLEANING

- A. Clean in accordance with Specification - PROJECT CLOSEOUT.
 - 1. Clean any soiled surfaces immediately.
 - 2. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.6 SCHEDULES

A. Sealant Schedule:

B. Sealants: Description of joint construction and location where sealant is typically applied

1. One-Part Neutral Cure Silicone Sealant:
 - a. Exterior and interior joints in vertical surfaces of concrete and masonry.
 - b. Between concrete masonry and stone.
 - c. Between metal and concrete, mortar, and stone.
 - d. Interior and exterior perimeter joints of metal frames in exterior walls.
 - e. Exterior overhead joints.
 - f. Use the applicable sealant for continual immersion in water applications, such as swimming pools, fountains and cooling towers – USDA Approved.
2. One-Part Acid-Curing Silicone Sealant:
 - a. Exposed joints within glazed curtain wall framing systems, skylight framing systems, and aluminum entrance framing systems, if applicable.
3. One-Part Mildew-Resistant Silicone Sealant:
 - a. White Grout Joints: Provide white silicone sealant material to match adjacent white grout joints in interior joints in vertical surfaces of ceramic tile in toilet rooms, showers, and kitchens.
 - b. Colored Grout Joints: Provide colored silicone sealant material to match adjacent colored grout joints in interior joints in vertical surfaces of ceramic tile in toilet rooms, showers, and kitchens.
4. One-Part Gun Grade Urethane Sealant:
 - a. Exposed joints in pre-cast, masonry, window frame perimeters and similar types of construction joints.
5. Multi-Component Gun Grade Urethane Sealant:
 - a. Control joints and window and door perimeters.
6. Multi-Component Gun Grade Urethane Sealant (Fast Curing):
 - a. Plaza Decks.
7. One-Part or Multi-Component Gun Grade Urethane Sealant (Security Sealant):
 - a. Control joints and window and door perimeters where sealant is exposed to physical abuse.
8. One-Part Pourable Self-Leveling Urethane Sealant:
 - a. Exterior and interior joints in horizontal surfaces of concrete.
 - b. Exterior and interior joints in horizontal surfaces between metal and concrete, mortar, stone, and masonry surfaces.
9. Multi-Component Pourable Self-Leveling Urethane Sealant (Fast Curing):
 - a. For use when walking surfaces require use within 24 hours of application without damage to joint surfaces.
 - b. Exterior and interior joints in horizontal surfaces of concrete.
10. Acrylic-Emulsion Sealant:
 - a. Paintable joints for the following surfaces expected to receive field painting:
 - 1) Interior joints in vertical and overhead surfaces at perimeter of elevator door frames and door frames (not requiring security grade sealant).
 - 2) Interior joints in gypsum board, plaster, concrete, and concrete masonry.
 - 3) All other interior field paintable joints not indicated otherwise.
11. One-Part Butyl Sealant:
 - a. Primarily used for glazing seals where little or no movement is expected.
12. Acoustical Sealant:
 - a. Joints to control dust, air, smoke and sound transmission, including under all exterior wall sill plates placed on top of Cast-In-Place Concrete slabs.
13. Firestop Sealants:
 - a. In fire-rated walls, compatible with wall ratings and in accordance with applicable penetration types in walls and floors, and in accordance with UL Classified numbers.

END OF SECTION

SECTION 081100 – METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Provide all material, labor, equipment and services necessary to fabricate and install all Custom Metal Door Panels and Metal Frame materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
 - a. Fire-Rated and Smoke-Rated Assemblies.
 2. Provide all material, labor, equipment and services necessary to fabricate and install Temperature Rise Fire-Rated Assemblies.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
1. DIVISION 00 SPECIFICATION SECTIONS.
 2. DIVISION 01 SPECIFICATION SECTIONS.
 3. 03 15 14 DRILLED ANCHORS
 4. 03 30 00 CAST-IN-PLACE CONCRETE
 5. 05 12 00 STEEL AND FABRICATIONS
 6. 06 10 00 ROUGH CARPENTRY
 7. 07 60 00 SHEET METAL
 8. 07 92 00 SEALANTS
 9. 08 70 00 HARDWARE
 10. 08 80 00 GLASS
 11. 09 22 16 METAL FRAMING
 12. 09 29 00 GYPSUM BOARD
 13. 09 30 00 TILE
 14. 09 67 23 RESINOUS FLOORING
 15. 09 68 40 CARPET
 16. 09 72 00 WALL COVERINGS
 17. 09 91 00 PAINTING
 18. 10 05 00 MISCELLANEOUS SPECIALTIES
 19. 10 14 00 IDENTIFYING DEVICES
 20. SPECIFICATION SECTIONS IN THE FACILITY SERVICE SUBGROUP.

1.2 REFERENCES

- A. Standards:
1. In accordance with the following standards:
 - a. ANSI American National Standards Institute
 - b. ASTM American Society of Testing and Materials
 - c. AWS American Welding Society
 - d. HMMA Hollow Metal Manufacturers Association (Division of NAAMM)
 - e. NAAMM National Association of Architectural Metal Manufacturers
 - f. NFPA National Fire Protection Association
 - g. NILECJ National Institute of Law Enforcement and Criminal Justice
 - h. UL Underwriter's Laboratory, Inc.
 - i. USSG U.S. Standard Gages
 - j. WH Warnock Hersey International

1.3 DEFINITIONS

- A. Minimum Thickness: Base metal thickness without coatings.
- B. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI / NAAMM-HMMA.
- C. Glazing Molding: Portion of the assembly retaining glazing materials or in-fill panels in a hollow metal door which contain the integral glazing stop, or to which a glazing stop is attached.
- D. Glazing Stop: A formed metal section used to secure glazing in a door or frame.
- E. Prepared Opening: Existing opening or wall constructed prior to installation of frames.

1.4 SYSTEM DESCRIPTION

- A. Design Requirements:
 - 1. Metal Door and Frame Assemblies.
 - a. All Doors shall be custom in accordance to NAAMM-HMMA Standards for Hollow Metal Doors.
 - b. All Frames shall be custom in accordance to NAAMM-HMMA Standards for Hollow Metal Frames.
 - 2. Fire Rated Assemblies:
 - a. Door and Frame Assemblies shall be custom in accordance to NAAMM-HMMA Standards for Fire-Rated Hollow Metal Doors and Frames and shall comply with all of the requirements for Doors and Frames.
 - b. Conform to the requirements of CBC, Chapter 7 "Fire and Smoke Protection Features".
 - 1) Fire-Rated Door Assemblies shall comply with NFPA 252 "Standard Methods of Fire Tests of Door Assemblies" and UL 10C "Positive Pressure Fire Tests for Door Assemblies."
 - 2) Fire-Rated Window Assemblies shall comply with NFPA 257 "Fire Testes for Fire Window Assemblies and Glass Block Assemblies," NFPA 80 "Standard for Fire Doors and Other Opening Protectives," and UL 9 "Fire Tests of Window Assemblies."
 - 3) Fire-Rated Door Assemblies shall also meet the requirements for a Smoke and Draft Control Door Assembly, complying with UL 1784 "Air Leakage Tests for Door Assemblies."
 - 4) Fire-Rated Doors and Frames shall be labeled by an DSA/FLS approved agency and shall comply with NFPA 80 "Standard for Fire Doors and Other Opening Protectives" and UL 1784 "Air Leakage Test for Door Assemblies."
 - c. All Fire-Rated Doors are to be positive latching and self or automatic closing in accordance with NFPA 80 "Standard for Fire Doors and Other Opening Protectives."
 - d. All Fire-Rated Assemblies shall be provided with approved gasketing material, so installed as to provide a seal where the door meets the stop on both sides and across the top.
 - 1) Continuous Hinges, Seals, etc. shall not obscure ratings of doors or door frames.
 - 3. Temperature Rise Fire-Rated Framing System:
 - a. Fire Rating: [60],[90],[120] minutes

- b. Frame Certification: Window Wall Assemblies shall comply with ASTM E 119 "Standard Test Methods for Fire Tests of Building Construction and Materials," NFPA 252 "Standard Methods of Fire Tests of Door Assemblies," NFPA 257 "Fire Tests for Fire Window Assemblies and Glass Block Assemblies," UL 263 "Fire Test of Building Construction and Materials," and UL 9 "Fire Tests of Window Assemblies."
- c. Testing Laboratory: Fire Tests shall have been conducted by an approved independent testing laboratory, similar to WARNOCK HERSEY INTERNATIONAL or UNDERWRITER'S LABORATORIES, INC.
- d. Appearance:
 - 1) Fire resistance rated Wall/Door Assembly shall have a neat finished appearance with minimum joints at decorative corner intersections.

1.5 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES.
 - 1. Contractor shall check all drawings and verify all dimensions (including wall thickness) in the field prior to fabrication.
 - 2. Contractor shall verify that shop drawings include all required materials and material clearances.
- B. Product Data:
 - 1. Include construction details, material descriptions, core descriptions, label compliance, fire-resistance ratings, temperature-rise ratings, and finishes for each type of product indicated.
 - a. Provide information indicating all the Structural Properties of the steel materials.
- C. Shop Drawings:
 - 1. Include, but not limited to, the following information:
 - a. Elevations of each door design and frame configuration.
 - b. Details of doors, including vertical and horizontal edge details.
 - c. Frame details for each frame type, including dimensioned profiles.
 - d. Details and location of reinforcement and preparations for hardware.
 - e. Details of each different wall opening condition.
 - f. Details of anchorages, joints, field splices, and connection.
 - g. Details of accessories.
 - h. Details of moldings, removable stops, and glazing.
 - i. Details of louvers, including sizes and location in doors, where required.
 - j. Details of conduit and preparations for power, signal, and control systems.
 - 2. Provide a Schedule, prepared by or under the supervision of supplier for doors, panels, and frames using same reference numbers for details and openings as those on the Drawings.
 - a. Coordinate with door hardware schedule.
 - 3. Provide setting drawings, templates, and directions for installing anchorage, including sleeves, concrete inserts, anchors, bolts, and items with integral anchors for installation coordination.
 - 4. Manufacturer's printed instructions for preparation, installation and care requirements for installers and inspecting authorities.
- D. Samples:
 - 1. When factory applied color is indicated, provide manufacturer's full range of factory applied color finishes for selection.
 - 2. Provide typical frame joint section and sample showing typical edge condition specified.

3. When Stainless Steel is indicated, provide samples of 3 inches by 5 inches for each type of exposed finish required.
 - a. Frames: Provide fabrication samples of profile and corner joints.
 - b. Doors: Provide fabrication sample of corner showing vertical edges and top.

E. Quality Assurance/Control Submittals:

1. Design Data:
2. Test Reports:
 - a. Product Test Reports based on evaluation of comprehensive test performed by a qualified testing agency, for each type of fire-rated metal door, panel, and frame assembly.
 - b. Water Tightness Test Reports.
3. Certificates:
 - a. Oversized Construction Certification.
 - b. Installer Certification for Temperature Rise Fire Rated Framing System.

F. Closeout Submittals in accordance with the following:

1. General Construction Warranty.
2. Workmanship and Materials Warranty.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Material Qualifications:
 - a. Fire-Rated Door and Frame Assemblies shall be labeled by an DSA/FLS approved agency and shall comply with NFPA 80 "Standard for Fire Doors and Other Opening Protectives" and UL 1784 "Air Leakage Test for Door Assemblies."
 - b. Oversized Door Assemblies required to be fire rated and exceeds the limitations of labeled assemblies, a certificate of inspection shall be furnished by an approved testing agency in lieu of an Oversized Fire Door Label.
2. Installer Qualifications:
 - a. Installer shall be experienced and shall have-successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 - b. Installer(s) shall have participated in mock-up installation that was successfully tested for water tightness.
3. Manufacturer/Supplier Qualifications:
 - a. Manufacturer/Supplier shall have successfully produced/supplied products similar to that required for this Project, and shall have sufficient production/supply capacity to produce/supply required units without causing delay in the work.
 - b. Manufacturers must be members of the HMMA, who have been engaged for at least two years in the production for sale of swing steel doors and frames on a national basis.
 - 1) All doors and frames shall be manufactured and supplied by the same manufacturer.
 - c. Manufacturer/Supplier of Temperature Rise Fire Rated Framing System shall provide experienced mechanics familiar with this type of specialized work.

B. In accordance with Specification Section - Regulatory Requirements.

C. Certifications:

1. Oversized Construction Certification for Fire-Rated Door Assemblies shall state that the door conforms to the requirements of the design, materials and construction, but has not been subjected to the fire test.

2. Manufacturer of Temperature Rise Fire-Rated Framing System shall certify the Installer, in writing, as qualified to install manufacturer's systems in accordance with manufacturer's warranty requirements.

D. Mock Ups:

1. Provide Mock-Ups prior to application of the final layer of the finished exterior wall material and prior to installation of any exterior wall cavity and interior materials.
2. Metal Frame Assembly:
 - a. Mock-Ups shall be of each type of opening assembly in every type of exterior wall assembly in which an opening occurs, shall integrate all other related work assemblies and shall be representative of the intended end use configuration.
 - 1) Provide a Mock-Up with a minimum opening size of 24 inches square for window opening.
 - b. Mock Ups will be used for establishing construction sequence, and installation requirements of materials, and creating water tight assemblies.
 - c. Mock-Ups may become part of the completed Work upon successful testing for water tightness.
3. Installation:
 - a. The Project Inspector, the Architect, Contractor's Superintendent and Sub-contractor's Superintendent shall observe the installation of materials.
 - b. Installation crew for the Mock-Ups shall be the installers of the metal frame systems for this project and installers, as necessary, of other related work assemblies.
 - c. Mock Ups shall include the installation of integral flashing, glazing, louvers, sheet metal flashing, sealants, water barriers and penetration flashing of exterior material systems and other materials of related work that makes the openings watertight.
 - d. Failed Mock Ups shall be removed and the assembly reinstalled until the water tightness test is successful.

E. Meetings:

1. Pre-Installation: Scheduled by Contractor prior to the start of work.
 - a. Coordinate the work with all other related work.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Establish protection procedures to maintain installed work until the Notice of Substantial Completion has been executed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packing, shipping, handling, and unloading:

1. Doors and Frames shall be palletized, wrapped, or crated to provide protection during transit and Project-Site storage. Do not use non-vented plastic.
 - a. Provide additional protection to prevent dents, scratches and other damage.

B. Acceptance at Site:

1. Do not deliver doors and frames to project site until Installer is ready and the site conditions will accommodate the installation of frames.
2. Damaged products will not be accepted.

C. Storage and Protection:

1. Storage and protection shall be in accordance with NAAMM-HMMA 840 Standard, "Installation and Storage of Hollow Metal Doors and Frames."
2. Store Doors and Frames under cover at Project Site. Stored on level platforms, minimum six (6) inches above ground, allowing air circulation under stacked units.
 - a. Doors and Frames shall be placed in the up-right position, spaced by blocking to allow ventilation between units.
 - b. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.

1.8 PROJECT CONDITIONS

A. Existing Conditions:

1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
2. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - a. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions for the fabrication of custom frames. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.9 WARRANTY

A. Contractor's General Warranty:

1. In accordance with Specification Section - WARRANTIES.

B. Manufacturer's Warranty:

1. Doors and Frames in accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.
2. Provide the Temperature Rise Rated Framing system warranty against defective workmanship and materials.
 - a. Warranty Period Five (5) years upon project completion and acceptance.

C. Installer's Warranty:

1. Issue to the Owner a warranty against defective workmanship and materials.
 - a. Warranty period Four (4) Years.
 - b. In accordance with the terms of the Specification Section - WARRANTIES.
 - c. Warranty shall include the responsibility for the repairs of any failure that is the result of defects in materials and workmanship.
 - d. Warranty shall certify that the installation of all exterior Metal Doors and Frames were done in accordance with the method and procedures established with the successful Mock-Up for water tightness.
 - e. The Warranty shall be co-endorsed by the General Contractor, the Metal Door and Frame Material Manufacturer, the Metal Door and Frame Installer and Glazing Installer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 - 1. Custom Metal Doors and Frames:
 - a. SECURITY METAL PRODUCTS CORPORATION.
 - b. Acceptable alternative manufacturers:
 - 1) CURRIES COMPANY.
 - 2) METAL MANUFACTURING CO., INC.
 - 3) STILES CUSTOM METAL, INC.
 - 2. Temperature Rise Fire-Rated Framing System:
 - a. TECHNICAL GLASS PRODUCTS
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: Commercial Steel (CS), Type B, conforming with ASTM A 1008/A 1008M "Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable." Steel shall be suitable for exposed to view applications.
- B. Hot-Rolled Steel Sheet: Commercial Steel (CS), Type B, conforming with ASTM A 1011/A 1011M "Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength." The steel shall be pickled and oiled, free of scale, pitting, coil-breaks or other surface defects.
- C. Metallic-Coated Steel Sheet: Commercial Steel (CS), Type B, complying with ASTM A 653/A 653M "Standard Specifications for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process." The steel shall have a-minimum G60 (Z180) zinc (galvanized) or A60 (ZF 180) zinc-iron-alloy (galvannealed) coating designation.
- D. Stainless Steel Sheet: Complying with ASTM A 666 "Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar."
- E. Inserts, Bolts and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M "Standard Specification for Zinc Coating (Hot-dip) on Iron and Steel Hardware."
- F. Insulation:

1. Mineral-Fiber Insulation: ASTM C 665 "Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing," Type I (blankets without membrane facing): consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 "Test method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C," for combustion characteristics.
 - a. Fire Rated Doors and Frames: Provide insulation that provides fire protection and/or temperature rise ratings as indicated.
 2. Expanded Foam Insulation suitable for injection into frame cavity.
 - a. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 3. Insulation for Miscellaneous work:
 - a. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
- G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- H. Sealants: Comply with Specification Section – SEALANTS.
1. Sealants shall be compatible with glazing and frames.

2.3 MANUFACTURED UNITS

- A. General:
1. Interior Doors and Frames: In accordance with NAAMM-HMMA 861 Standard, "Guide Specifications for Commercial Hollow Metal Doors and Frames," unless otherwise indicated in the Contract Documents.
 2. Stainless Steel Doors and Frames: Shall comply with all requirements of Exterior and Interior Doors and Frames, except as follows:
 - a. Highly Corrosive: Shall be constructed using Type 316 Stainless Steel sheets for all internal and external components and parts.
 - b. Moderately Corrosive: Doors and frames shall be constructed using Type 304 Stainless Steel sheet for all internal and external components and parts.
 - c. Aesthetic: door and frame external components and parts shall be constructed using Type 304 Stainless Steel sheets. Internal components and parts shall comply with all requirements of Exterior and Interior Doors, Panels, and Frames.
 3. Temperature Rise Fire-Rated Framing System: In accordance with specified Manufacturer's product system. TECHNICAL GLASS PRODUCTS' "Fire Frames Heat Barrier Series."
- B. Doors:
1. Design shall be custom seamless hollow construction in the flush type variations as indicated.
 - a. Thickness 1-3/4 inch.
 2. Face Sheets:
 - a. Interior Doors shall be fabricated from Cold-Rolled Steel Sheets.
 - 1) Interior Doors 18 gage minimum.
 3. Core:
 - a. Steel Stiffened with continuous vertical formed steel sections fabricated from same materials as face sheets.
 - 1) Interior Door 22 gage minimum.
 - b. Spaces between stiffeners shall be insulated the full height of the door.

4. Top and Bottom Edges:
 - a. Close with continuous recessed and flush filler channels fabricated from same material as face sheets.
 - 1) Interior Door 16 gage minimum.
 - b. All doors shall have an additional flush filler channel at top and flush filler channel at bottom edges, unless recess channel at bottom is required for hardware.
 - c. All channels shall be fabricated from same material as face sheets.
 5. Jamb Edges:
 - a. Reinforce with continuous "U" channels fabricated from same material as face sheets.
 - 1) Interior Door 16 gage minimum.
 - b. Astragals shall be fabricated from same material as face sheets. 14-gage minimum.
 6. Hardware Reinforcements:
 - a. Interior Doors: Reinforcing Plates shall be fabricated from the same material as the face sheets in the minimum thickness as follows:
 - 1) Hinges and Pivots 7-gage.
 - 2) Continuous Hinges 14-gage.
 - 3) Mortise Hardware 10-gage.
 - 4) Locks, Exit Devices, Flush Bolts, Concealed Holders, Concealed Hardware or Surface-Mounted Closures 12-gage.
 - 5) Pull Plates, Bars and all other Surface-Mounted Hardware 16-gage.
 7. Glazing Moldings and Stops:
 - a. Fabricate from the same material as the door face sheets.
 - 1)
 - 2) Interior Doors 20-gage minimum.
 8. Door Louvers: In accordance with NAAMM-HMMA Standard 810 "Hollow Metal Doors" and fabricate from the same material as the door face sheets.
 - a. Interior Doors:
 - 1) Internal Channels 16-gage minimum.
 - 2) Vanes 18-gage minimum.
 - a) Reinforcement 0.25inch x 1.5 inch minimum.
 - b. Fire-Rated Doors:
 - 1) Movable vanes closed by actuation fusible link and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated.
 - c. Non-Rated Doors: Provide sightproof louver of stationary vanes of inverted "Y" Type blade construction with a 30 percent free area, unless noted otherwise.
- C. Panels:
1. Metal Panels shall be made of the same materials, construction and finishes complying with all requirements for Metal Doors.
 2. Attachment:
 - a. Attach securely to frame with concealed anchorage and machine screws.
 - b. Attachment including screws shall be fully concealed when door is closed.
- D. Frames:
1. Design shall be custom seamless hollow construction in the variety of configurations as indicated.
 2. Interior Frames shall be fabricated from Cold-Rolled Steel Sheets.
 - a. Openings 4'-0" or less 16-gage minimum.
 - b. Openings greater than 4'-0" 14-gage minimum.
 3. Glazing Stops shall be fabricate from the same material as Frames.
 - a. Exterior Frames 16-gage minimum.
 - b. Interior Frames 20-gage minimum.

4. Internal Frame Stiffeners shall be fabricated from the same material as Frames.
 - a. Head of Frames 12-gage.
 5. Internal Reinforcing Tabs shall be fabricate from the same material and gage thickness as Frame.
 6. Hardware Reinforcements:
 - a. Interior Frames: Reinforcing Plates shall be fabricated from the same material as the Frame in the minimum thickness as follows:
 - 1) Hinges and Pivots 7-gage full width of frame x 10".
 - 2) Continuous Hinges 14-gage full width of frame x entire frame length.
 - 3) Strike Hardware 12-gage.
 - 4) Flush Bolts 12-gage.
 - 5) Closers 12-gage.
 - 6) Surface-Mounted Hardware 12-gage.
 - 7) Hold-Open Arms 12-gage.
 - 8) Surface Panic Devices 12-gage.
 7. Grout Guards: Grout Guards shall be fabricated from the same material as the Frame in minimum 22-gage thickness.
- E. Frame Anchors:
1. Interior Frames: Frame Anchors shall be fabricated from Cold-Rolled Steel Sheets or Hot-Rolled Steel Sheets, unless indicated otherwise.
 - a. Masonry Wall not less that 2" wide x 10" long Anchors.
 - 1) Non Grouted Frames 16 gage T-Strap Anchors.
 - 2) Grouted Frames 16 gage perforated Adjustable Strap & Stirrup Anchors.
 - a) Wire Loop Anchors of 0.156" diameter steel wire may be used at non-fire-rated frames that are fully grouted.
 - b. Concrete Walls 16 gage Pour In Place Anchors.
 - c. Wood Stud Frame Walls 18 gage Wood Stud Anchors.
 - 1) Anchor shall be not less than 2" wide x 10" long.
 - d. Metal Stud Frame Walls 18-gage Metal Channel Stud Anchors.
 - e. Jamb Base 14-gage Fixed or Adjustable Floor Anchors.
 - f. Floor Base 16 gage Existing Wall Anchors.
 - 1) Where indicated 16 gage Fixed Mullion Anchors.
 - g. Prepared Openings 16-gage Existing Wall Anchors.
 - 1) Where indicated 16 gage continuous Rough Buck Anchors.
- F. Temperature Rise Fire Rated Framing System:
1. Steel: Internal tube steel framing shall conform to ASTM A 501 "Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing." Formed steel retainers shall be galvanized conforming to ASTM A653/A653M "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process."
 2. Glazing Stops (Beads): Extruded steel.
 3. Insulation:
 - a. Promatect-H
 - b. Mineral Wool Fire Stop Insulation
 4. Fasteners: All fasteners shall be zinc-plated steel.
 5. Framing Covers:
 - a. Extruded aluminum alloy 6063-T5 (standard) or aluminum alloy 5052 when anodized.
 6. Glazing Accessories:
 - a. Calcium Silicate Setting Blocks.
 - b. Approved Glazing Gaskets, Compound and Tapes:
 - 1) EPDM glazing gaskets

- 2) Close cell PVE tape
 - 3) Pure silicone sealant. Intumescent tape.
 - c. All other accessories necessary for a complete installation.
 - 7. Door Hardware:
 - a. Furnish hardware for [60,][90,][120] minute Temperature Rise Rated Framing Doors by the manufacturer. Hardware shall be per the door manufacturer's standard recommended and approved hardware. Coordinate with Specification Section - HARDWARE for cylinders and keying.
 - 1) All Hardware shall be BHMA Certified.
- G. Fasteners:
- 1. Screws, bolts, washers, shields, spacers and other similar fastening devices:
 - a. Provide stainless steel vandal resistant screws when outside exterior face glass stops are indicated.
 - b. Furnish and install as required by frame installer.
 - c. Provide Stainless Steel fasteners at Stainless Steel Frames.

2.4 FABRICATION

- A. Shop Assembly:
- 1. General:
 - a. Fabricate in accordance NAAMM-HMMA Standard 810 "Hollow Metal Doors" and NAAMM-HMMA Standard 820 "Hollow Metal Frames," and NAAM-HMMA Standard 850 "Fire-Rated Hollow Metal Doors and Frames."
 - b. Fabricate to the required size and profiles by accurately forming, welding edges straight, sharp and true. Corner bends shall be true and straight and of minimum radius for the gage of metal used.
 - c. All finish work shall be strong, rigid and neat in appearance with corners, hairline joints and surfaces free from warp, wave, buckle, tool marks, surface imperfections or other defects.
 - d. Welding to conform to applicable standards of AWS for high grade finished metal fabrication. All exposed welds shall be ground, filled and dressed smooth with no voids, tool marks, surface imperfections or ridges showing to make them invisible and provide a smooth flush surface.
 - e. Assemblies shall be shop fabricated and permanently assembled before shipment.
 - 1) Where shipping limitations so dictate, frames for large openings shall be fabricated and prepared in section designated for assembly in the field and clearly identified.
 - 2. Metal Door Fabrication:
 - a. General: All doors shall be of the types and sizes required and shall be fully welded seamless construction with smooth surfaces without visible joints of seams on exposed faces or edges.
 - 1) Glazed Lites shall be factory cut openings in doors.
 - 2) Provide weep-hole openings in the bottom of exterior doors to permit the escape of entrapped moisture.
 - b. Face Sheets: Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door.
 - c. Core: Stiffeners shall extending full-door height and spanning the full thickness of the interior space between door faces.
 - 1) Space Stiffeners no more than 6" apart and securely attached to both face sheets by spot welds spaced a maximum of 5" o.c..
 - 2) Solidly pack cavities the entire height of door with mineral-fiber insulation.

- a) Fire Door Cores: As required to provide fire-protection and temperature-rise ratings as indicated.
- d. Top and Bottom Edges: Closing Channels shall extend the full width of the door at top and bottom edges.
 - 1) All doors shall have recessed Closing Channels, spot welded to both faces. When left exposed, fill all gaps with epoxy sealer and filler, sand smooth with no tool marks or surface imperfections.
 - 2) All doors shall have flush-filler Closing Channels in addition to recessed Closing Channels. Channels shall be continuously welded and ground smooth with no marks at all doors.
 - a) Flush-filler Closing Channel shall be omitted at bottom edge when recess channel is required for hardware.
- e. Jamb Edges: Reinforcing Channels shall extend the full height of the door.
 - 1) Edge profiles shall be provided on both vertical edges of doors as follows:
 - a) Single-Acting Swing Doors beveled 1/8" in 2".
 - b) Double-Acting Swing Doors rounded on 2-1/8" radius.
 - 2) Astragal: Flat x 1-1/2 inch, continuous welded to panel, ground smooth with no tool marks or surface imperfections. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
 - a) Provide overlapping astragal on one leaf of pairs of doors where required for fire-performance rating or where indicated.
 - b) At exterior doors, provide overlapping astragal at strike. Cope astragal around strike plate.
- f. Hardware Reinforcements: Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware contractor.
 - 1) Where surface-mounted hardware is to be applied, doors shall have reinforcing plates only under the face of door.
- g. Glazing Moldings and Stops: Provide glazing moldings and stops to secure glazing material and louvers. Moldings and stops shall be flush with face sheets of door. Use the same trim profile on all Fire-Rated and Non Fire-Rated Openings.
 - 1) Fixed Glazing Moldings shall be securely welded to both face sheets of door.
 - 2) Removable Glazing Stops shall be channel shaped and have mitered hairline corner joints. Drill and dimple stop for countersinking and concealment of fasteners spaces equally at 9" o.c. maximum and a maximum of 2" from ends. Snap-on attachments will not be permitted.
 - 3) Metal surfaces underneath the glazing stops and the inside of the glazing stops shall be treated for maximum paint adhesion and painted with a rust inhibitive primer prior to installation in the door.
 - 4) Coordinate depth and rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
- h. Louvers: Flush opening with all welded construction.
 - 1) Internal channels securely welded to the inside of both face sheets of door.
 - 2) Provide vertical reinforcement at midpoint when louver width exceeds 18" inches.
- 3. Metal Panel Fabrication: Comply with all requirements for Metal Doors.
 - a. Attach securely to frame with concealed anchorage and machine screws.
 - 1) Attachment, including screws, shall be fully concealed when door is closed.
- 4. Metal Frame Fabrication:
 - a. General: All frames shall be welded units of the sizes and profiles indicated and shall be of seamless hollow construction with smooth surfaces without visible joints of seams on exposed faces or edges.

- 1) Metal Frame Spreaders shall be temporarily attached at bottom of all open frames for shipping and storage.
 - b. Frame Sections: All frames are to be rolled and brake formed with integral nailing flanges, back bends, faces, rabbits, stops, and soffits, unless indicated otherwise.
 - 1) Provide 3 ½ inch wide integral Nailing Flanges at exterior frames. The flange shall be continuous all around the frame at head, jambs and wall sills without gaps at the corner joints. Coordinate flange length with height of concrete curb.
 - 2) Punch and Dimple frames at attachment points for countersinking and concealment of all through the frame anchorage fasteners.
 - c. Frame Joints:
 - 1) Perimeter Corners: Head, Jamb and Wall Sills Members shall be saw-mitered and fully (continuously) welded along entire joint from the throat or the unexposed side at Flanges, Returns, Faces, Rabbet, Stops, and Soffits.
 - 2) Perimeter Butts: Entire joint shall be fully (continuously) welded along entire joint at Flanges, Returns, Faces, Rabbet, Stops, and Soffits from the throat or the unexposed side of the frame.
 - a) Interior Frames: Continuously weld only the Faces. Rabbits, Stops and Soffits shall to be tightly fitted and appear as a hairline seams.
 - b) Vertical Mullions members shall extend through Floor Sill Members to floor. Floor Sill Members Stops are to be notched.
 - 3) Internal Flush and Indented Butts: Vertical Mullions Members shall be continuous, butt to Head and Sill Members and extend through Horizontal Rail Members. Vertical Mullion Stops are to be notched at Head and Sill Members and the Horizontal Rail Stops are to be notched to Vertical Member. Continuously weld only the Faces.
 - a) Interior Frames: Rabbits, Stops and Soffits shall to be tightly fitted and appear as a hairline seams.
 - d. Alignment and Reinforcing Tabs: Provide internal alignment and reinforcing tabs at each joint of field splices with a minimum overlap of 2".
 - e. Internal Frame Stiffeners: Provide additional continuous steel "U" Channel extending the full width of frame and shall be factory welded into head of frame.
 - 1) Grouted Frames with openings greater than 4'-0" width.
 - 2) Frames with openings greater than 12'-0" in width.
 - f. Hardware Reinforcements: Frame shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware contractor.
 - 1) Where surface-mounted hardware is to be applied, frames shall have reinforcing plates only under face of frame.
 - g. Glazing Stops: Provide channel shaped removable Glazing Stops to secure glazing material or panels. Glazing Stops shall be continuous and have butted hairline corner joints.
 - 1) Coordinate stop depth and rabbit width between fixed and removable stops with type of glazing and type of installation indicated.
 - a) Stop Depth 5/8" depth minimum.
 - 2) Drill and Dimple stops for countersinking and concealment of fasteners uniformly spaced at 9 inches o.c. maximum and not more than 2 inches maximum from each corner.
 - 3) Metal surfaces underneath the glazing stops and the inside of the glazing stops shall be treated for maximum paint adhesion and painted with a rust inhibitive primer prior to installation in the door.
5. Frame Anchors:

- a. Coordinate the type of frame anchors with the type of frame insulation or grout being used so that the frame is fully packed with no voids.
 - b. All Frame Anchors shall be securely welded to the throat at inside of frames.
 - c. Frame Anchor Spacing: All Frame Anchors at head, jamb and sill shall be placed a maximum of 8" from frame corners, and ends, with the remainder of the anchors to be equally spaced, not to exceed a maximum of 24" o.c. for all walls types unless indicated otherwise.
 - 1) Stud Framed Walls: The spacing of anchors shall be equal spaced, not to exceed a maximum of 18" o.c.. Total number of anchors provided on each jamb shall be not less than the following:
 - a) Frames up to 4'-0" height 4 anchors.
 - b) Frames 4'-0" to 7'-6" high 5 anchors.
 - c) Frames 7'-6" to 8'-0" height 6 anchors.
 - d) Frames over 8'-0" height provide six (6) anchors plus one (1) additional anchor for each 2'-0" or fraction thereof in height over 8'-0".
 - 2) Jamb Base: Provide floor anchors for each jamb and mullion that extends to floor.
 - a) When conditions do not permit the use of a floor anchor, an additional jamb anchor shall be substituted at a location not to exceed 8" from the base of the jamb.
 - 3) Floor Base: When conditions do not permit the use of Existing Wall Anchors at floor sill members, provide continuous rough buck for frame anchorage.
 - 6. Rubber Door Silencers: Except on weather/sound strip or fire gasket doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single Swing Door Frames Provide and install three (3) at strike jamb.
- B. Temperature Rise Rated Framing System Fabrication:
- 1. Steel Frame: Profiled steel tubing permanently joined with steel bolts.
 - a. Pre-weld frame assemblies.
 - b. When necessary, splice frames too large for shop fabrication or shipping or to fit in available building openings.
 - c. Knock-down door perimeter frames are not permitted.
 - 2. Insulation: Insulate framing system against effects of fire, smoke and heat transfer from either side, Insulate profiled steel tubing using a shell construction that incorporates Promatect-H intermediate interlayer.
 - 3. Glazing Stops (Beads): Fabricate with dimensions recommended by manufacturer to securely hold glazing material in place.
 - 4. Fasteners: Type recommended by manufacturer.
 - 5. Prepare steel door assemblies for field mounting of hardware.
- C. Fabrication Tolerances:
- 1. General: Clearances and Tolerances shall be in accordance with NAAMM-HMMA Standard 862 for Exterior Assemblies and NAAMM-HMMA Standard 861 for Interior Assemblies.

2.5 FINISHES

- A. Shop Priming:
- 1. After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities.

2. Clean and chemically treat (phosphatize) the metal to insure maximum paint adhesion in preparation for primer paint.
 3. Apply rust-inhibitive primer paint to all surfaces, minimum dry thickness of 0.7 mils. Manufacturer to provide primer for prolonged exposure that are compatible with substrate and field-applied coatings.
 - a. Coordinate primer used with field-applied paint finishes that are indicated and specified.
 - b. Shop Primer shall not be considered as a substitution for any primer required as part of the field-applied paint finishes.
 - c. Rust-inhibitive primer shall be fully cured before packaging and shipment.
- B. Shop Finishes:
1. Factory-applied Paint Finish:
 - a. Temperature Rise Rated Framing: Apply manufacturer's standard powder coating finish system complying with AAMA [2603][2604][2605].
 - 1) Comply with manufacturer's written instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
 - 2) Applied to factory-assembled frames before shipping.
 - 3) Color and Gloss: Color as selected by Architect from Manufacturer's full range of colors.
 2. Exposed Metal Finishes:
 - a. Stainless Steel Finish: Comply with NAAMM HMMA 802 Manufacturing of Hollow Metal Doors and Frames "Finishes for Stainless Steel." Refer to NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating stainless steel finishes.
 - 1) Unpolished Finish: No. 2B, bright cold rolled finish.
 - 2) Polished Finishes:
 - a) No. 6 Soft Satin Finish, low reflectivity and produced by Tampico brushing the No. 4 finish using a medium abrasive.
 - b) No. 8 Most Reflective Finish, produced by polishing with successively finer abrasive, then budding with a very fine buffing compound until free of grit lines caused by preliminary grinding.
 - 3) All grained finishes applied to frames and jambs shall be vertical. Finishes applied to the frame header and sills shall be horizontal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions:
1. Prior to the installation of the work under this specification section, examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work under this specification section.
 - a. Temperature Rise Rated Framing System:
 - 1) Openings shall be plumb, square and within allowable tolerances recommended by manufacturer. Maximum 3/8" shim space at all walls.
 2. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
 3. Report conditions detrimental to performance of the work under this specification section. Proceed with installation only after unsatisfactory conditions have been corrected.

4. Installation of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Protection:

1. Protect all adjacent surfaces from damage from work under this specification section.

B. Surface preparation:

1. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling and dressing, as required to repair area smooth, flush and invisible on exposed faces.
2. Prior to installation, All frames with temporary spreaders removed, shall be checked for size, and swing, and corrected to installation tolerance for squareness, alignment, twist and plumbness. Securely brace frames and maintain installation tolerances within the following limits.
 - a. Opening Width: Plus 1/16 inch, minus 1/32 inch, measured from rabbet to rabbet at top, middle and bottom of frame.
 - b. Opening Height: Plus 1/16 inch, minus 1/32 inch, measured measured vertically between the frame head rabbet and top of floor or bottom of frame minus jamb extension at each jamb and cross the head.
 - c. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - d. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - e. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines and perpendicular to plane of wall.
 - f. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
3. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General:

1. Install metal doors and frames plumb, rigid, properly aligned and securely fastened in place; comply with NAAMM-HMMA Standard 840, "Installation and Storage of Hollow Metal Doors and Frames."
2. Install in accordance with manufacturer's instructions and recommendations unless specifically noted otherwise.
3. Install Fire-Rated and Smoke-Control Assemblies in accordance with NFPA 80 "Standard for Fire Doors and Other Opening Protectives" and NFPA 105 "Standard for the Installation of Smoke Door Assemblies and Other Openings."

B. Frames:

1. Set frames accurately in position, plumbed, aligned, and temporarily braced secure, until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.

- 1) At exterior frames, Body Putty smooth entire joint continuously along returns, rabbets, stops, and soffits creating a watertight joint. Sand flush with no voids or ridges.
 2. Solidly insulate within the throat of all non-grouted exterior and interior frames for the full depth, width and length of frame.
 - a. Provide fire-rated mineral fiber insulation as required to provide fire-protection and temperature-rise ratings as indicated at Fire Rated Assemblies.
 - b. Inject expanding foam insulation as required.
 3. Jamb Base: Secure in place frame anchors to floor with post-installed expansion anchors.
 4. Floor Base: Secure frames in place with post-installed expansion anchors to floor. Countersink fasteners, fill with body putty, sand smooth and flush with no voids or ridges. Conceal installed fasteners as to be invisible at exposed faces.
 5. Stud Frame Walls: Secure frames in place with screw fasteners at frame anchors to wall framing.
 6. Frame and Wall Joints: Provide joint sealants to maintain watertight and airtight continuous seals that aesthetically join dissimilar materials without causing staining or deterioration of joint substrates. Application of sealants shall be in strict compliance with manufacturer's instructions.
 - a. Provide integral color sealants at exterior joints and paintable sealants at interior joints.
 - b. Clean out joint between frames and masonry or concrete to a depth of 3/4 inch. Fill with rod and sealants.
 7. Field-apply compatible and paintable sealant at all frame joints that are exposed to the exterior for the full depth of the frame at returns, rabbits, stops and soffits.
- C. Doors: Fit doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Doors:
 - a. Between door and frame at jambs and head 3/16 inch maximum.
 - b. Between edges of pairs of doors 3/16 inch maximum.
 - c. Door Sill Clearances: Coordinate with threshold conditions and floor materials.
 - 1) Between bottom of door and top of threshold 3/8 inch maximum.
 - 2) Between bottom of door and floor with no threshold 3/4 inch maximum.
 2. Fire-Rated and Smoke-Control Doors: Install doors with clearances according to NFPA 80 "Standard for Fire Doors and Other Opening Protectives" and NFPA 105 "Standard for the Installation of Smoke Door Assemblies and Other Openings."
 - a. Between bottom of door and floor covering surface 1/2 inch maximum.
- D. Glazing Stops:
1. Coordinate and comply with installation requirements for all glazing indicated and specified.
 2. Secure Glazing Stops to frames and doors with corrosion resistant countersunk flat or oval-head machine screws.
 - a. All exterior screws (head, jamb and sills) shall be attached with a bed of sealant at the penetration point into the frame for a positive seal against water intrusion.
 - b. Countersink fasteners, fill with body putty, sand smooth and flush with no voids or ridges. Conceal installed fasteners as to be invisible at exposed faces.
 3. All exterior stops shall receive a full bed of sealant at back channel leg for the full length of opening, during final glazing installation for positive seal against water intrusion.
 - a. Coordinate sealants with the requirements of the glazing specified.
- E. Temperature Rise Rated Framing System:

1. Install per Manufacturer's written instructions.
2. Set continuous sill members and flashing in full sealant bed to produce watertight installation.
3. Firmly pack perimeter of framing system to rough opening with mineral wool fire safing / fire stop insulation or appropriately rated intumescent sealant.
4. Do not install damaged frames or chipped glazing units.
5. Install plumb and true. Limit out of plumb or true to 1/8 inch in 10'-0" in any dimensions.
6. Fasteners: Type and spacing as recommended by manufacturer.
7. Install glazing in strict accordance with fire resistant glazing material manufacturer's specifications.
 - a. The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant glazing tape.
 - b. The glazing panels shall be caulked continuously around the edge to the tube steel frame utilizing neutral cure silicone.
 - c. Set glass using calcium silicate, or setting blocks.

3.4 FIELD QUALITY CONTROL

A. Site Tests:

1. As required by Regulatory Requirements.
2. Mock-Up Assemblies:
 - a. Water Spray Test: Upon completion of the installation of the Mock-Up Assembly, conduct test for water penetration in according to AAMA 501.2 requirements.
 - 1) The Project Inspector, the Architect, Contractor's Superintendent and Sub-contractor's Superintendent shall visually inspect for water penetration.
 - 2) A Thermal Imaging process conducted by a Owner's Testing Laboratory Service, shall be used for additional inspection for water penetration.
 - 3) Cost of additional testing and inspection required due to failure for water tightness shall be borne by the Contractor.
 - b. Reports:
 - 1) Project Inspector and/or Owner's Testing Laboratory Services shall provide a written report noting the installation and water tightness of the Mock-Up Assemblies tested.

B. Inspection:

1. Notification: Schedule all inspections. Notify the Architect, Project Inspector and any regulatory agencies of the time at least 48 hours prior to the inspection.
2. Regulatory Requirements: No work shall be excepted without the required inspections being performed.

3.5 ADJUSTING

- A. Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operation condition. Coordinate with hardware suppliers for function and use.
- B. Remove and replace defective work, including work that is warped, bowed, or other wise unacceptable.

3.6 CLEANING

- A. Clean in accordance with Specification Section - TEMPORARY FACILITIES AND CONTROLS.
 - 1. Immediately clean all adjacent surfaces from all foreign materials.
 - 2. Immediately remove grout, sealants and any foreign materials from bonding to metal doors and frames.
 - 3. In accordance with manufacturer's instructions and recommendations.
- B. Metal Doors and Frames finishes shall be clean and ready of application of any additional finishes after installation.
 - 1. Prime-Coat Surfaces: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
 - 2. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
 - 3. Stainless Steel Surfaces: Scratched and marred surfaces (including field welding) shall be cleaned and promptly be finished smooth. Refinish to match original finish.
- C. Temperature Rise Rated Framing System: Limit repair and touch-up to minor repair of small scratches. Use only manufacturer's recommended products.
 - 1. Repairs shall match original finish for quality, material and view.
 - 2. Repairs and touch-up shall not be visible from a distance of 5 feet, Owner and Architect to approve.

3.7 PROTECTION

- A. Protect and maintain conditions that ensures the work is without damage or deterioration until the time of Completion has been executed.
 - 1. Maintain in a manner acceptable to manufacturer's and installer's warranty.

END OF SECTION

SECTION 08 31 13 – ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all materials, labor, equipment and services necessary to furnish and install Equipment Access Doors, accessories and other related items necessary to complete Project as indicated by the Contract Documents unless specifically excluded.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 06 10 00 ROUGH CARPENTRY
 - 4. 08 11 00 METAL DOORS AND FRAMES
 - 5. 09 22 16 METAL FRAMING
 - 6. 09 29 00 GYPSUM BOARD
 - 7. 09 30 00 TILE
 - 8. 09 91 00 PAINTING
 - 9. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data.
 - a. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.
 - b. Submit manufacturer's standard color range for selection by the Architect.
 - 2. Shop Drawings.
 - a. Submit shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loading, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Closeout Submittals in accordance with Specification Sections in Division One:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Operation Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - c. Project Record Documents in accordance with Specification Section - PROJECT DOCUMENTS.
 - d. Warranty in accordance with Specification Section - WARRANTIES.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 - b. Engage an experienced Installer who is certified in writing by the manufacturer listed herein as qualified to install manufacturer's product (or system) in accordance with manufacturer's warranty requirements.
 - 2. Manufacturer/Supplier Qualifications:

- a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.
- B. In accordance with Specification Section - REGULATORY REQUIREMENTS.
- C. Meetings:
 - 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 - 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintaining installed work until the Notice of Substantial Completion has been executed.

1.4 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.
- C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 - 1. Specified product manufacturer:
 - a. MILCOR INCORPORATED, INC.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Access Doors:
 - 1. Design: Equal to Style AP, DW, AT, K or M Access Door as manufactured by MILCOR INCORPORATED, Lima, Ohio.
 - a. Design shall match material conditions present in each specific location.

- b. In Cement Plaster locations, provide not less than 16 gage frames with a minimum of 24 gage expanded or perforated metal wings designed to finish flush with plaster.
- 2. Size: Refer to Architectural, Plumbing, Mechanical, and Electrical Drawings.
- 3. Material: Steel Frame and Door.
- 4. Operation: Manual
- 5. Lock: Key operated cylinder lock
- 6. Finish: Shop Primed, unless otherwise noted.
 - a. In Shower, Toilet, or Locker Rooms all exposed portions shall be brushed stainless steel.
- 7. Fire Rating: To match wall or ceiling assembly in which doors are located in accordance with Underwriters Laboratories ratings.
 - a. Continuous Hinges shall not obscure rating of doors and frames.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordination:

- 1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
- 2. Coordinate access doors with related items specified under other Sections to ensure proper and adequate interface of work. Particular attention is called to all Plumbing, Mechanical, and Electrical Specifications and drawings and the full cooperation required with that subcontractor's needs and work.

3.2 INSTALLATION

A. General:

- 1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
- 2. In accordance with approved submittals.
- 3. In accordance with Regulatory Requirements.
- 4. Set plumb, level, and square.

END OF SECTION

SECTION 08 80 00 – GLASS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all glass materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 07 92 00 SEALANTS
 - 4. 08 11 00 METAL DOORS AND FRAMES
 - 5. 08 15 13 LAMINATE-FACED WOOD DOORS
 - 6. 09 91 00 PAINTING
 - 7. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 8. 10 14 00 IDENTIFYING DEVICES
 - 9. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. AAMA American Architectural Manufacturers Association.
 - b. ANSI American National Standards Institute.
 - c. ASTM American Society for Testing and Materials.
 - d. CSPC Consumer Products Safety Commission.
 - e. FGMA Flat Glass Marketing Association Glazing Manual, 1990 Edition.
 - f. GANA Glass Association of North America
 - g. GTA Glass Tempering Association.
 - h. IGCC Insulating Glass Certification Council.
 - i. LSGA Laminated Safety Glass Association.
 - j. SGCC Safety Glazing Certification Council.
 - k. SIGMA Sealed Insulating Glass Manufacturers Association.

1.3 DEFINITIONS

- A. Manufacturer is used in this Section to refer to a firm that produces primary glazing, fabricated glazing, or both as defined in the referenced glazing standards.
 - 1. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written directions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
 - 2. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written directions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated glass standard.

3. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed the manufacturing process and not to causes other than glass breakage and improper practices for maintaining, and cleaning insulating glass contrary to manufacturers written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on the interior surfaces of glass.
4. f.o.b. – "Free On Board".
5. Glass Surfaces:
 - a. Single Glazed:
 - 1) Surface #1: exposed to outdoors.
 - 2) Surface #2: exposed to indoors.
 - b. Dual Glazed:
 - 1) Interior Lite:
 - a) Surface #3: faces insulating "air" space. Secondary location for energy efficient coatings.
 - b) Surface #4: exposed to indoors.

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements: It is the intention of this specification and the drawings to form a guide for a completely sealed glazing system. Any items not specifically noted but necessary for a completely sealed glazing system shall be provided under this section.
 1. Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure, including loss or glazing breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.
 2. Glass Design: Glass thickness indicate minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:
 - a. Minimum glass thickness for lites in exterior walls shall be not less than 6.0mm (1/4" nom.).
 3. Thermal Movement: Provide glazing that allows for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on material's actual surface temperatures due to both solar heat gain and nighttime sky heat loss.
 - a. Temperature Change Range: 120 deg F, ambient; 180 deg F, material surfaces..

1.5 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 1. Coordination Drawings:
 - a. Submit installer's coordination drawings indicating the work of this section with that of related work of other sections for proper interface of the completed work. Installer shall coordinate and obtain approvals from the work of other related sections prior to submitting to the Architect.
 2. Product Data.
 - a. Submit manufacturer's product data for each glazing product and accessory material indicated.
 3. Samples.
 - a. Provide 12-inch square sample of each glass type, color and pattern selected.
 - b. Provide 6-inch square samples of insulated glazing panels for each glazing type and pattern selected.

- c. Provide 12-inch-long samples of each type of glazing sealant, gasket or glazing tape. Install sealant or glazing material sample between two strips of material representative in color of the adjoining framing system.
- 4. Quality Assurance/Control Submittals:
 - a. Test Reports:
 - 1) Compatibility and Adhesion Test: From sealant manufacturer indicating that glazing sealants were tested for adhesion to glass and glazing channel substrates and compatibility with glass and other glazing material.
 - b. Certificates:
 - 1) Contractor's Certification.
 - 2) Qualification Data:
 - a) Material Qualifications.
 - b) Installer Qualifications.
 - c) Manufacturer/Supplier Qualifications.
 - 3) Product Certificates:
 - a) Fire-Resistive Ceramic Glazing materials.
 - c. Manufacturer's Written Instructions:
 - 1) Manufacturer's written installation instructions for all products.
- 5. Closeout Submittals in accordance with the following:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Record Documents in accordance with Specification Section - RECORD DOCUMENTS.
 - c. Warranty in accordance with Specification Section - WARRANTIES.
 - 1) Special Warranties:
 - a) Coated Glass Products.
 - b) Laminated Glass Products.
 - c) Insulated Glass Products.
 - d) Insulated Glazing Products.

1.6 QUALITY ASSURANCE

A. Qualifications:

- 1. Material Qualifications:
 - a. Comply with published recommendations of glazing product manufacturers and organizations listed, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - b. Obtain glazing from one source for each product indicated.
- 2. Installer Qualifications:
 - a. An experienced Installer who has completed three (3) projects similar in materials, design and extent to that indicated for this Project; whose work has resulted in glass installation with a record of successful in-service performance.
- 3. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.

B. Regulatory Requirements:

- 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. All glazing shall comply with provisions of CBC Chapter 24 for quality standards and CBC Section 2403.1 for identification.
 - b. All glazing subject to Hazardous Locations shall comply with Safety Glazing Requirements and CBC Chapter 2406.

C. Certificates:

1. Contractor's Certification: Provide a letter on Contractor's Letterhead certifying work provided, meets or exceeds, the Code Minimum requirements, and the other specified requirements of this Section.
2. Qualification Data: Contractor's installation certificates.
3. Product Certificates: Glazing materials manufacturers certifying that their products comply with specified requirements.
4. Fire-Resistive Ceramic Glazing materials certification that products comply with CPSC Requirements.

D. Meetings:

1. Pre-Installation: Schedule prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - c. Pre-glazing conference: Scheduled by the Contractor prior to the start of any glazing operation for the proper performance of the work.
 - 1) Minimum agenda shall be to review the work required; discuss field observations, problems, and decisions; corrective measures if necessary; and maintenance of quality and work standards in accordance with manufacturer's warranty requirements.
2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintaining installed work until the Notice of Substantial Completion has been executed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packing, shipping, handling, and unloading:

1. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.
 - a. Protect glazing materials to comply with manufacturer's written directions and as needed to prevent damage to glazing and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
2. Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass fabricator's recommendations for venting and sealing to avoid hermetic seal ruptures.

B. Acceptance at Site:

1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
2. Damaged products will not be accepted.

C. Storage and Protection:

1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.
 - a. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.

1.8 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - a. Do not install liquid sealants when ambient and substrate temperature conditions are outside of limits by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

- A. Contractor's General Warranty:
 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 1. In accordance with manufacturer's written standard warranty.
 2. Manufacturer's Warranty on Coated Glass Products:
 - a. Submit written warranty signed by coated glass manufacturer agreeing to replace coated glass units that deteriorate as defined in "Definitions" article, f.o.b. the nearest shipping point of Project Site, within specified warranty period.
 - b. Warranty Period: Five (5) Years.
 - 1) From date of Substantial Completion.
- C. Installer's Warranty:
 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period One (1) Year.
 - 1) From date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 1. Specified Annealed Float Glass product manufacturer, or approved equivalent:
 - a. Class 1 materials:
 - 1) VITRO ARCHITECTURAL GLASS (formerly PPG INDUSTRIES, INC.).
 - 2) Acceptable Alternative Class 1 Manufacturers:
 - a) AFG INDUSTRIES, INC.
 - b) CARDINAL GLASS INDUSTRIES.
 - c) GUARDIAN INDUSTRIES CORPORATION
 - d) PILKINGTON SALES (NORTH AMERICA) LTD.
 - b. Class 2 materials, Pyrolytic Coated (On-Line Process):
 - 1) VITRO ARCHITECTURAL GLASS (formerly PPG INDUSTRIES, INC.), "Graylite" Tinted Glass.
 - 2) Acceptable Alternative Class 2 Pyrolytic (On-Line) manufacturers:
 - a) AFG INDUSTRIES, INC.
 - b) PILKINGTON SALES (NORTH AMERICA) LTD.
 - c. Class 2 materials, Applied Coating:
 - 1) VIRACON INC.
 - 2) Acceptable Alternative Class 2 Applied Coating manufacturers:
 - a) AFG INDUSTRIES, INC.
 - b) CARDINAL GLASS INDUSTRIES.

- c) GUARDIAN INDUSTRIES CORPORATION.
 - d) PILKINGTON SALES (NORTH AMERICA) LTD.
 - e) VITRO ARCHITECTURAL GLASS (formerly PPG INDUSTRIES, INC.)
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. General:
- 1. All glazing shall comply with all provisions of CBC Chapter 24.
 - a. Provide the required strength of glazing to comply with the area limitation set forth in CBC Table 2403.2.1 for individual lites.
 - 2. Refer to the Glass Schedule of this section for the class of each Glazing Type.
 - 3. Refer to the Insulating Glazing Panel Schedule of this section for the class of each Insulated Glazing Panel Type.
- B. Annealed Float Glass: ASTM C 1036 "Specification for Flat Glass," Type I, and and ASTM C 1048 "Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass," Type (transparent glass, flat), Quality q3 (glazing select), of Class indicated.
- C. Heat-Treated Float Glass: ASTM C 1048 "Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass," Type I (transparent glass, flat), Quality q3 (glazing select), of class, kind and condition indicated.
- 1. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.
 - 2. Provide Kind HS (Heat-Strengthened) float glass in place of annealed float glass where needed to resist thermal stresses indicated by differential shading of individual glass lites and to comply with glass design requirements.
 - 3. Uncoated Glass: Comply with the requirements for Condition A.
 - 4. Coated Glass: Comply with the requirements for Condition C.
 - 5. Tempered: Provide Kind FT (Fully Tempered) float glass in place of annealed or Kind HS (Heat Strengthened) float glass where safety glass is indicated.

2.3 ACCESSORIES

- A. Elastomeric Glazing Sealants:
- 1. General: Provide products of type indicated, complying with the following requirements:
 - a. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glazing products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 - b. Suitability: Comply with sealant and glazing manufacturer's written recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
 - c. Colors: Provide color of exposed joint sealants to comply with the following:
 - 1) Match colors indicated by reference to manufacturer's standard designations.
 - 2) Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.
 - 2. Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 "Specification for Elastomeric Joint Sealants," requirements indicated in Specification Section - SEALANTS, including those referencing ASTM classifications for Type, Grade, Class and Uses.
- B. Glass Tapes:

1. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended in writing by tape and glazing manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with ASTM C 1281 "Specification for Preformed Tape Sealants for Glazing Applications," and AAMA 800 "Voluntary Specifications and Test methods for Sealants" for products indicated below:
 - a. AAMA Section 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

~~C. Mirrored Glazing Materials:~~

- ~~1. Adhesive that is compatible with the backing of the mirrors.~~

~~D.C. Miscellaneous Glass Materials:~~

1. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glass materials involved for glass application indicated, and with a proven record of compatibility with surfaces contacted in installation.
2. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
3. Setting Blocks: Elastomeric material with a Shore Type A durometer hardness of 85 plus or minus 5.
4. Spacers: Elastomeric blocks or continuous extrusions with a Shore Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
5. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).
6. Plastic Foam Joint Fillers: Pre-formed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.
7. Perimeter Insulation for Fire-Resistive Glass: Identical to product used in test assembly to obtain fire-resistive rating.

2.4 FABRICATION

- A. Fabricate glass and other glass products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instruction and recommendations of product manufacturer and referenced glazing standard, to comply with system performance requirements.
- B. Clean cut or flat grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.
- C. Grind smooth and Polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual which affect the execution of work under this specification section.
 - a. Examine glass framing, with glazier present, for compliance with the following:
 - 1) Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
 - 2) Presence and functioning of weep system for aluminum framing systems, and proper sealing of hollow metal frame systems with no weep systems.

- 3) Minimum required face or edge clearances.
- 4) Effective sealing between joints of glass-framing members.
2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Coordination:
 1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
- B. Protection:
 1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.
- C. Surface preparation:
 1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
 2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.
 3. Clean glass channels and other framing members receiving glass immediately before glazing.
 4. Remove coatings that are not firmly bonded to substrates.
 5. Wipe down any mirror backing with alcohol before applying mirror adhesives.

3.3 INSTALLATION

- A. Glass, General:
 1. Comply with installation standards of CBC Chapter 24.
 - a. Glass subject to human impact shall be installed in accordance with CBC 2406.
 2. Comply with combined written instructions and recommendations of manufacturers of glass, insulated glass panels, sealants, gaskets, and other glass materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
 3. Glass channel dimensions, as indicated on Drawings, provide necessary bite on glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
 4. Protect glass from edge damage during handling and installation as follows:
 - a. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
 - b. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
 5. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
 6. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 7. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 8. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:

- a. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glass tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
 - b. Provide 3.0mm (1/8" nom.) minimum bite of spacers on glass and use thickness equal to sealant width. With glass tape, use thickness slightly less than final compressed thickness of tape.
 9. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
 10. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- B. Tape Glazing:
 1. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sight-line of stops.
 - a. Slightly recess tape at exterior conditions, and continuously cap bead with elastomeric sealant leaving no open joints.
 2. Install tapes continuously but not in one continuous length.
 - a. Do not stretch tapes to make them fit opening.
 3. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs.
 4. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
 5. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped.
 6. Do not remove release paper from tape until just before each lite is installed.
 7. Seal joints in tapes with compatible sealant approved by tape manufacturer.
 - a. Apply continuous heel bead of elastomeric sealant at all exterior hollow metal framing stops.
 - b. Install a continuous toe bead of elastomeric sealant at all exterior hollow metal framing stops on installations with Laminated Glass, Wire Glass or Insulated Glazing Panels.
 - c. Apply continuous cap bead of elastomeric sealant over exposed edge of tape.
 8. Install tapes on all fixed and loose stops.
- C. Sealant glazing (Wet):
 1. Install continuous spacers between glass lites and glass stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems (if any) until sealants cure.
 - a. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
 2. Force sealant into glass channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
 3. Tool exposed surfaces of sealants to provide a substantial wash away from glass.
 - a. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.4 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
 1. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion.
 - a. Wash glass as recommended in writing by glazing manufacturer.

3.5 PROTECTION

- A. Protection from traffic:

1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.
2. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass.
 - a. Do not apply markers to glass surface.
 - b. Remove nonpermanent labels, and clean surfaces.
3. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter.
 - a. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended in writing by glass manufacturer.
4. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended in writing by glass manufacturer.
5. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

3.6 GLASS SCHEDULE

1. C1-1T Tempered Clear Float:

a.	Thickness	6 mm (1/4" nominal).
b.	Heat Treated, per ASTM C1048	Kind FT.
c.	Minimum Visible Light (%) Transmittance	89.
d.	Solar Heat Gain Coefficient (SHGC)	0.81.
e.	"U" Factor:	
	1) Winter Night-time	1.03.
	2) Summer Daytime	0.93.

END OF SECTION

SECTION 09 22 00 – METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all metal framing materials (both Cold-Formed Framing and Light gage Metal Framing), accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 15 14 DRILLED ANCHORS
 - 4. 03 30 00 CAST-IN-PLACE CONCRETE
 - 5. 05 12 00 STEEL AND FABRICATIONS
 - 6. 06 10 00 ROUGH CARPENTRY
 - 7. 06 41 23 MODULAR CASEWORK
 - 8. 07 21 00 INSULATION
 - 9. 07 60 00 SHEET METAL
 - 10. 07 72 00 ROOF ACCESSORIES
 - 11. 07 92 00 SEALANTS
 - 12. 08 11 00 METAL DOORS AND FRAMES
 - 13. 08 15 13 LAMINATE-FACED WOOD DOORS
 - 14. 09 29 00 GYPSUM BOARD
 - 15. 09 30 00 TILE
 - 16. 09 50 00 ACOUSTICAL CEILINGS
 - 17. 09 68 40 CARPET
 - 18. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 19. 10 44 00 FIRE PROTECTION SPECIALTIES
 - 20. 11 40 00 FOOD SERVICE EQUIPMENT
 - 21. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. In accordance with the following:
 - 1. AISI American Iron and Steel Institute
 - 2. ASTM American Society for Testing Materials
 - 3. AWS American Welding Society
 - 4. ICC International Code Council.

1.3 DEFINITIONS

- A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of metal framing delivered to the Project site shall be not less than 95 percent of the thickness used in the metal framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements: It is the intention of this section and the drawings to form a guide for a complete framing system. Any items not specifically noted but necessary for a complete framing system shall be provided under this section.
 - 1. Wall systems shall accommodate tolerances, deflection of building structural members, and clearances of intended openings.
 - 2. Fire-Test-Response Characteristics: Where indicated, provide metal framing materials and construction identical to that of assemblies tested for fire resistance.

- a. Per ASTM E 119 "Test methods for Fire Tests of Building Construction and Materials" by a testing and inspecting agency acceptable to Authorities Having Jurisdiction (AHJ), products used in the assembly shall carry a classification label from a testing laboratory acceptable to the AHJ.

1.5 SUBMITTALS

A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:

- 1. Product Data: For each type of product indicated.
 - a. Materials list of items proposed to be provided under this section.
- 2. Quality Assurance/Control Submittals:
 - a. Test Reports:
 - 1) Current ICC ES Report.
 - 2) Welding inspection report per DSA/SSS "T & I" List.
 - b. Certificates:
 - 1) Welding certificates indicating qualifications.
 - 2) Mill certificates, per ICC AC46 "Acceptance Criteria for Cold-Formed Steel Framing Members", indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, and metallic-coating thickness. Comply also with CBC Section 2203A.1.
 - c. Manufacturer's Written Instructions:
 - 1) Manufacturer's written recommended installation procedures shall become the basis for accepting or rejecting actual installation procedures on the work.
- 3. Closeout Submittals in accordance with the following:
 - a. Warranty in accordance with Specification Section –WARRANTIES.

1.6 QUALITY ASSURANCE

A. Qualifications:

- 1. Material Qualifications:
 - a. Galvanized and carbon sheet steel products formed from steel with a minimum yield stress of 33 ksi for 18 gage and lighter member and 50 ksi for 16 gage and heavier members.
 - b. All products shall be engineered to meet the latest Edition of the American Iron and Steel Institute (AISI), "North American Specification for the Design of Metal Steel Structural Members".
 - c. All products manufactured shall comply with the CBC and AISI, and shall have a current ICC Evaluation Service Report (ICC ESR).
 - 1) AISI "Code of Standard Practice for Cold-Formed Steel Structural Framing".
- 2. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 - b. Welders shall be qualified for welding in horizontal, vertical, and overhead positions in accordance with AWS D1.3.
- 3. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.

B. In accordance with Specification Section - REGULATORY REQUIREMENTS.

C. Meetings:

- 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with other work being performed.

- b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
- 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
- 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintaining installed work until the Notice of Substantial Completion has been executed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. General: Steel Framing and related accessories shall be stored and handled in accordance with AISI "Code of Standard Practice for Cold-Formed Steel Structural Members".
- B. Packing, shipping, handling, and unloading:
 - 1. Products shall be handled in such a manner as to assure that they are free from corrosion, deformation, dents, scratches and other damage.
- C. Acceptance at Site:
 - 1. Products must be in manufacturer's original unopened bundles and containers with labels indicating brand name, size, and grade.
 - 2. Damaged products will not be accepted.
- D. Storage and protection:
 - 1. Metal Framing and related accessories shall be stored and handled in accordance with the AISI "Code of Standard Practice".
 - 2. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.
 - a. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.

1.8 PROJECT CONDITIONS

- A. Existing Conditions:
 - 1. Examine project and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 - 2. Field Measurements: Take and be responsible for field measurements as required. Report any significant differences between field dimensions and the contract document conditions to Architect.
 - 3. Carefully coordinate work under this Section with that of the structural framing sections and details so that the interface between structural framing and nonstructural framing shall provide the lines and degree of finish shown and specified.

1.9 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty, in accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.
- C. Installer's Warranty in accordance with Specification Section – WARRANTIES:
 - 1. :
 - a. Warranty period One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.

1. Studs, Tracks, Ceiling Joists, Channels and Steel Accessories specified product manufacturer:
 - a. CLARK DIETRICH BUILDING SYSTEMS, LLC (CDBS).
 - b. Acceptable alternative manufacturers:
 - 1) CEMCO.
 - 2) SCAFCO.
 - 3) STUDCO.
2. Slotted Deflection Track and Vertical Deflection Clip accessories specified product manufacturer, unless otherwise noted:
 - a. BRADY INNOVATIONS "SLP-TRK" Slotted Deflection Track.
 - b. CLARK DIETRICH BUILDING SYSTEMS, LLC (CDBS).
 - 1) Vertical Deflection Clips:
 - a) "Fast Top Clips"
 - b) "Fast Clip Slide Clips"
 - c) "Quick Clip"
 - d) "Slide Clip"
 - c. Acceptable alternative manufacturers:
 - 1) CEMCO.
 - 2) SCAFCO.
 - 3) STUDCO.
3. Shaftwall specified product manufacturer:
 - a. CLARK DIETRICH BUILDING SYSTEMS, LLC (CDBS).
 - b. Acceptable alternative manufacturers:
 - 1) CEMCO.
 - 2) SCAFCO.
 - 3) STUDCO.
4. Flat Strap and Backing Plate:
 - a. CLARK DIETRICH BUILDING SYSTEMS, LLC (CDBS):
 - 1) "DanBack" Fire Treated Wood Backing Plate.
 - b. Acceptable alternative manufacturers:
 - 1) CEMCO.
 - 2) SCAFCO.
 - 3) STUDCO.
5. Channel Bridging or Bracing:
 - a. CLARK DIETRICH BUILDING SYSTEMS, LLC (CDBS):
 - 1) "Spazzer 9200" Bridging and Spacer bar.
 - 2) "EasyClip" and "U-Series" Clip Angle.
 - b. Acceptable alternative manufacturers:
 - 1) CEMCO.
 - 2) SCAFCO.
 - 3) STUDCO.
6. Metal screw specified product manufacturer:
 - a. GRABBER CONSTRUCTION PRODUCTS.

- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

A. Steel Sheet:

1. Steel sheet for 16 gage and heavier shall comply with ASTM A 1003 "Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members," structural steel classification, Grade 50 ksi, Class 1 or 2.
2. Steel sheet for 18 gage and lighter shall comply with ASTM A 1003 "Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members," structural steel classification, Grade 33 ksi, Class 1 or 2.
3. When hot-rolled steel sheet and strip is used in fabrication of metal members they shall comply with ASTM A1011 "Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength," structural steel classification, Grade 50 ksi.

B. Coating:

1. Steel sheet shall be galvanized in accordance with ASTM A 1003 "Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members," G60 minimum and comply with ASTM A 924 "Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process."
 - a. Vertical Deflection Clips shall be in accordance with ASTM A 1003 "Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members," G90 minimum and ASTM A 924 "Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process."
2. When hot-rolled steel sheet and strip is used in fabrication of metal members, hot-dip galvanize coating shall be in accordance with ASTM A 123 "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products."

C. Thickness:

REFERENCE GAGE	MILS	MINIMUM BASE METAL THICKNESS (INCH)	MINIMUM DESIGN THICKNESS (INCH)
20	33	0.0329	0.0346
18	43	0.0428	0.0451
16	54	0.0538	0.0566
14	68	0.0677	0.0713
12	97	0.0966	0.1017
10	118	0.1180	0.1240

2.3 COMPONENTS

- A. Studs: Manufacturer's standard C-shaped steel studs, punched, with stiffened flanges, complying with ASTM C 645 "Specification for Nonstructural Steel Framing Members."
- B. Track: Manufacturer's standard U-shaped steel track, unpunched, with unstiffened flanges, complying with ASTM C 645 "Specification for Nonstructural Steel Framing Members."
1. Slotted Deflection Track: Manufacturer's single, 20 gage minimum, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges with vertical slotted holes, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.
 - a. Product, or approved equivalent, must be approved by DSA/SSS.
 - b. Slotted Deflection Track must be rated for both 1 and 2 hour "T" and "F" Fire-Rated Assemblies.
 2. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 - a. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads.

- C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure.
- D. Ceiling Joists: Manufacturer's standard C-Shaped steel sections, with stiffened flanges, complying with ASTM C 645 "Specification for Nonstructural Steel Framing Members."
- E. Channels: In sizes as shown in the Contract Documents:
 - 1. 16 gage, 3/4 inch with 1/2-inch flange 300 lbs/1000 feet weight.
 - 2. 16 gage, 1-1/2 inch with 17/32-inch flange 500 lbs/1000 feet weight.
 - 3. 16 gage, 2 inch with 17/32-inch flange 590 lbs/1000 feet weight.
- F. Shaftwall: Manufacturer's standard shapes for fire-rated assemblies and complying with ASTM C 645 "Specification for Nonstructural Steel Framing Members." Shapes shall be 20 gage minimum, unless noted otherwise.
 - 1. Track: Manufacturer's standard J-Runner Shaped Track (JR), tabbed, with un-stiffened flanges.
 - 2. Studs: Manufacturer's standard C-H (CH), E-S (ES), I-S (IS) Shaftwall Studs, punched with stiffened flanges.
 - 3. Jamb Strut: Manufacturer's standard corner and Jamb Strut (JS), un-punched, with un-stiffened flanges.
- G. Flat Strap and Backing Plate: Galvanized Steel Sheet for blocking and bracing in length and width required.
 - 1. Standard Backing shall be 16 gage minimum and continuous. Notch backing at studs.
- H. Channel Bridging or Bracing:
 - 1. U-Channel Assembly per ASTM C 645 "Specification for Nonstructural Steel Framing Members," Base Metal Thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
- I. Steel Accessories: Fabricate Backing, Bridging, Clip Angles, Strap and Shapes in configurations shown and in compliance with ASTM C 645 "Specification for Nonstructural Steel Framing Members."
 - 1. Standard Backing shall be 16 gage minimum and continuous. Notch backing at studs.

2.4 ACCESSORIES

- A. Fasteners:
 - 1. Metal Screws: Provide corrosion-resistant-coated, self-drilling or self-tapping steel screws complying with ASTM C 1513 "Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections" and ICC ESR 2196 "HILTI Self-Drilling and Self-Piercing Screws."
 - a. Provide low profile "Truss Head" framing screws so that subsequent substrates lay flat over fasteners.
 - 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 "Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members" conducted by a qualified independent testing agency.
 - 3. Expansion Anchors: Refer to Specification Section – DRILLED ANCHORS.
- B. Welding Electrodes: Comply with AWS Standards.
- C. Galvanized Repair Paint: Provide product complying with ASTM A 780 "Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings."
- D. Drypack Grout: Refer to Specification Section – CAST-IN-PLACE CONCRETE.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 - 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual which affect the execution of work under this specification section.

2. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
3. Carefully coordinate all requirements for pipes and other items designed to be housed within the partition, wall or ceiling systems.
4. Carefully coordinate all requirements for backing support of items to be mounted on finished walls.
5. Space metal framing as required for compliance with all pertinent regulations, to give proper support for the facing material, and as indicated on the Drawings.

3.2 PREPARATION

A. Protection:

1. Protect all adjacent surfaces from damage from work under this specification section.
2. Remove any fireproofing only as much of these materials as needed to complete installation of metal framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

B. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.
3. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.3 INSTALLATION

A. General:

1. In accordance with drawings and manufacturer's written instructions and recommendations, and procedures described in ASTM C 754 "Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products."
2. In accordance with approved submittals.
3. In accordance with Regulatory Requirements.
4. Set plumb, level, and square.
5. Metal Framing may be shop or field fabricated for installation, or it may be field assembled.

B. Layout:

1. Lines shall be straight and true.
2. Install Metal Framing according to ASTM C 754 "Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products," unless more stringent requirements are indicated.

C. Installation:

1. Install shop or field fabricated, Metal Framing and securely anchor to supporting structure.
 - a. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch in ten (10) feet.
2. Install Metal Framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements of the Contract Documents.
 - a. Cut framing members by sawing or shearing; do not torch cut.
 - b. Fasten Metal Framing members by welding or screw fastening. Wire tying of framing members is not permitted.

- 1) Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - 2) Locate mechanical fasteners and install, with screw penetrating joined members by not less than three exposed screw threads.
 - 3) Beneath sheathing provide low-profile screw heads (i.e. "Wafer Head").
 - 4) Fasten both flanges of studs to track, unless otherwise indicated.
 3. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
 4. Punched openings in studs must align when placed in final position.
 5. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
 6. Install horizontal bridging in wall studs, spaced in rows as indicated on the drawings. Fasten at each stud intersection.
 7. Do not bridge building expansion and control joints with Metal Framing. Independently frame both sides of joints.
 8. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
 9. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
 10. Erection Tolerances: Install Metal Framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - a. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 11. At all sound partitions, set floor runners in two 1/4 inch diameter continuous beads of acoustical sealant as prescribed in Specification Section - SEALANTS.
 12. At all smoke barrier partitions, set floor and ceiling runners in two 1/4 inch diameter continuous beads of Class II Flame Spread and Smoke Developed rated acoustical sealant as prescribed in Specification Section - SEALANTS.
 13. Install supplementary backing and bracing wherever walls or partitions are indicated to support equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to wall or partition. Comply with stud manufacturer's written instructions and industry standards.
 14. Frame wall openings larger than 2-foot square with double stud at each jamb.
 15. Install continuous strapping to side of studs that do not receive sheathing at 3'-6" o.c. vertically.
 - D. Ceiling Joist Installation:
 1. Align and install joist track and ceiling joists plumb, square, and true to line bearing on supporting frame. Securely fasten connections according to manufacturer's written recommendations and requirements of the Contract Documents.
 2. Install bridging at interval indicated on the drawings. Fasten at each joist intersection.
- 3.4 REPAIR / RESTORATION
- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed Metal Framing with galvanized repair paint and manufacturer's written instructions.
 - B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure Metal Framing is without damage or deterioration at time of Substantial Completion.
- 3.5 FIELD QUALITY CONTROL
- A. Site Tests:

1. As required by Regulatory Requirements.
- B. Inspection:
 1. As required by Regulatory Requirements.
 2. Schedule inspections and notify the Architect, Project Inspector and any other regulatory agencies of the time at least 48 hours prior to the inspection.
 3. Project Inspector shall verify that all stud cavity walls are free of moisture and dry prior to any other construction that encloses the wall cavity.

END OF SECTION

SECTION 09 29 00 – GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide material, labor, equipment and services to complete GYPSUM BOARD system and related items necessary to complete the Project as indicated by the Contract Documents
- B. Section Includes:
 - 1. Interior gypsum board systems.
 - 2. Exterior gypsum panel systems.
 - 3. Suspension systems.
 - 4. Furring systems.
- C. Related Sections:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 06 10 00 ROUGH CARPENTRY
 - 4. 06 41 23 MODULAR CASEWORK
 - 5. 07 21 00 INSULATION
 - 6. 07 92 00 SEALANTS
 - 7. 08 11 00 METAL DOORS AND FRAMES
 - 8. 08 31 13 ACCESS DOORS AND FRAMES
 - 9. 09 22 16 METAL FRAMING
 - 10. 09 30 00 TILE
 - 11. 09 50 00 ACOUSTICAL CEILINGS
 - 12. 09 65 10 RESILIENT BASE AND ACCESSORIES
 - 13. 09 67 23 RESINOUS FLOORING
 - 14. 09 68 40 CARPET
 - 15. 09 72 00 WALL COVERINGS
 - 16. 09 91 00 PAINTING
 - 17. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 18. 10 14 00 IDENTIFYING DEVICES
 - 19. 10 44 00 FIRE PROTECTION SPECIALTIES
 - 20. 11 40 00 FOOD SERVICE EQUIPMENT
 - 21. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. CISCA Ceilings & Interior Systems Construction Association.
 - 2. DITF Drywall Industry Trust Fund.
 - 3. GA Gypsum Association.
 - 4. MPI Master Painters Institute
 - 5. PDCA Painting and Decorating Contractors of America.
 - 6. PDSM Plaster and Drywall Systems Manual, ©1988 by BNI and McGraw-Hill, Inc., Third Edition.

1.3 SUBMITTALS

- A. Per Specification Section - SUBMITTAL PROCEDURES:
- B. Product Data.
 - 1. Gypsum panel products.
 - 2. Suspension system products.
 - 3. Furring products.
 - 4. Acoustical sealant products.

5. Soundboard products.
 6. Sound-attenuation blanket products.
 7. Gypsum panel fastening schedule: Indicate type, size and spacing of fasteners for each type of framing and fire resistive condition.
 8. Manufacturer's written recommended construction instructions for specified systems.
- C. Samples.
1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.
 2. Finishes: 24-inch square for each finish indicated and on same backing indicated for Work.
 3. Suspension System: Full-size Sample in 12-inch long length for each Suspension System accessory indicated.
- D. Quality Assurance/Control Submittals:
1. Test Reports: Site Tests of suspended gypsum board ceiling fasteners and anchors provided by Testing Agency.
 2. Certificates:
 - a. General Construction: Certificate signed by the Contractor on Contractor's letterhead.
 - b. Products: Certificates signed by manufacturers of gypsum board assembly components.
 3. Closeout Submittals per Specification Section -PROJECT DOCUMENTS.
 4. Warranty per Specification Section - WARRANTIES.
- 1.4 QUALITY ASSURANCE
- A. Material Qualifications:
1. Where fire-rated gypsum board assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 "Test methods for Fire Tests of Building Construction and Materials," by an independent testing and inspecting agency acceptable to CSFM.
 2. Empty containers shall not be removed from site without the Project Inspector's approval.
- B. Installer Qualifications:
1. Engage an experienced Installer who has successfully completed 3 projects of similar scope and size to that indicated for this Project.
 - a. Helpers and apprentices used for such work shall be under full and constant supervision at all times by thoroughly skilled gypsum board installers.
 - b. In the acceptance or rejection of installed gypsum board, no allowance will be made for lack of skill on the part of installers.
- C. Certificates:
1. General Construction: Contractor to certify that work provided, meets or exceeds the requirements of this section.
 2. Manufacturers of gypsum board assembly components certify that their products comply with specified requirements.
 - a. Certify that all adhesive and compound materials have a good shelf life longer than the construction period of this project.
- D. Mockups:
1. Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and qualities of materials and execution.
 - a. Install mockups for the following Architectural finishes:
 - 1) GB-1 – Uniformly smooth exposed to view.
 - 2) GB-2 – Textured exposed to view.
 - 3) GB-4 – Uniformly smooth to receive wallcoverings.

- b. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - c. Simulate finished lighting conditions for review of mockups.
 - d. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Meetings:
 - 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 - 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, handling, and unloading:
 - 1. Handle packages carefully to assure products are without scratches, dents, and damage.
- B. Acceptance at Site:
 - 1. Provide products in manufacturer's original unopened containers labeled with brand name, model, and grade.
 - 2. Damaged products will not be accepted.
- C. Storage and protection:
 - 1. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 WARRANTY

- A. Contractor's General Warranty: per Specification Section - WARRANTIES
 - 1. In accordance with.
- B. Manufacturer's Warranty: 1 year.
 - 1. Manufacturer agrees to repair or replace gypsum panel product or accessory that fail within specified warranty period.
- C. Installer's Warranty: 1 year.
 - 1. Installer agrees to repair or replace components of gypsum panel product or accessory that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specified products define size, pattern, color range, function, and performance selected by the Architect for this Project. Acceptable alternatives and substitutions must comply with the requirements of this Project. If the Architect does not approve acceptable alternatives or substitutions, then the Contractor shall provide the specified products.

- B. Obtain each type of gypsum panel and joint finishing material from single source with resources to provide products of consistent quality in appearance and physical properties.
- C. Request to substitute products from manufacturers not listed via Specification Section - SUBSTITUTION PROCEDURES.

2.2 GYPSUM BOARD FOR INTERIOR

- A. Wallboard: For interior walls and ceilings.

Specified	NATIONAL GYPSUM COMPANY	Gold Bond "Gypsum Board" and "Fire-Shield"
Acceptable alternate	PABCO BUILDING PRODUCTS	"Regular Interior" and "Flame Curb"
Acceptable alternate	UNITED STATES GYPSUM COMPANY	Sheetrock "Gypsum Panels" and "Firecode X"

1. ASTM C 1396 "Standard Specification for Gypsum Board."
2. ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials": Flame Spread 20, Smoke Developed 0.
3. Size: 5/8 inch thick by maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
4. At curved walls: provide layers of 1/4 inch and 3/8 inch thick.
5. At fire-resistive-rated assemblies: Type X.
6. Long Edges: Tapered.
7. Finish: Natural-finish face paper suitable for paint, wallpaper or other decorations.

- B. Moisture-Resistant: for interior walls subjected to intermittent moisture and humidity, and at adhesive application of wallcoverings and tile.

Specified	NATIONAL GYPSUM COMPANY	Gold Bond "XP" and "XP Fire-Shield"
Acceptable alternate	PABCO BUILDING PRODUCTS	"Mold Curb Plus" and "Mold Curb Plus Type X"
Acceptable alternate	UNITED STATES GYPSUM COMPANY	Sheetrock "Mold Tough" and Mold Tough Type X"

1. ASTM C 1396 "Standard Specification for Gypsum Board."
2. ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials": Flame Spread 20, Smoke Developed 0.
3. Mold Resistance: ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi": 0.
4. Mold Resistance: ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber": 10.
5. Water Absorption: ASTM C 473 "Test method for Air Content of Freshly Mixed Concrete by the Volumetric Method": less than 5 percent.
6. Size: 5/8 inch thick by maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
7. Long Edges: Tapered.
8. At fire-resistive-rated assemblies: Type X.
9. Finish: Moisture- and mold-resistant core, and paper surfaces suitable for paint, wallpaper or other decorations, or tile.

- C. **Impact Board:** For interior walls requiring impact resistance.

Specified	NATIONAL GYPSUM COMPANY	Gold Bond "Hi-Impact XP"
Acceptable alternate	PABCO BUILDING PRODUCTS	"Impact Resistant"
Acceptable alternate	UNITED STATES GYPSUM COMPANY	Sheetrock "Mold Tough VHI"

1. Moisture- and mold-resistant core, embedded fiberglass mesh, and abrasion and mold/mildew/moisture resistant paper surfaces suitable for paint, wallpaper or other decorations, or tile.
2. Core: 5/8" Type X.
3. Long Edges: Tapered.
4. ASTM C 1629 "Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels."
 - a. Surface Abrasion Resistance: Level 3.
 - b. Indentation Resistance: Level 1.
 - c. Soft Body Impact: Level 3.
 - d. Hard Body Impact: Level 3.
5. Mold Resistance: ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi": 0.
6. Mold Resistance: ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber": 10.
7. Water Absorption: ASTM C 173 "Test method for Air Content of Freshly Mixed Concrete by the Volumetric Method": less than 5 percent.
8. Surface Burning Characteristics: ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials": Flame Spread 15, Smoke Developed 0.

D. Abuse Resistant: For interior walls and ceilings requiring greater impact resistance.

Specified	NATIONAL GYPSUM COMPANY	Gold Bond "Hi-Abuse XP"
Acceptable alternate	PABCO BUILDING PRODUCTS	"Abuse Curb"
Acceptable alternate	UNITED STATES GYPSUM COMPANY	Sheetrock "Mold Tough AR"

1. Moisture- and mold-resistant core, and abrasion and mold/mildew/moisture resistant paper surfaces suitable for paint, wallpaper or other decorations, or tile.
2. Core: 5/8" Type X.
3. Long Edges: Tapered.
4. ASTM C 1629 "Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels."
 - a. Surface Abrasion Resistance: Level 3.
 - b. Indentation Resistance: Level 1.
 - c. Soft Body Impact: Level 1-2.
5. Mold/Mildew Characteristics:
 - a. Mold Resistance: ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi": 0.
 - b. Mold Resistance: ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber": 10.
 - c. Water Absorption: ASTM C 173 "Standard Test Methods for Physical Testing of Gypsum Panel Products": less than 5 percent.
6. Surface Burning Characteristics: ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials": Flame Spread 15, Smoke Developed 0.

E. Shaftwall: For interior walls and ceiling at shafts, area separations, floor/ceiling assemblies, etc.

Specified	NATIONAL GYPSUM COMPANY	Gold Bond "Shaftliner XP"
Acceptable alternate	PABCO BUILDING PRODUCTS	"Mold Curb Plus Shaftliner"
Acceptable alternate	UNITED STATES GYPSUM COMPANY	Sheetrock "Liner PanelMold Tough"

1. Multi-layered paper facings, chemically treated to resist moisture penetration.
2. ASTM C 1396 "Standard Specification for Gypsum Board."

3. Size: 1 inch thick by 2 foot wide maximum by practical length to minimize joints.
4. Long Edges: Beveled.
5. At fire-resistive-rated assemblies: Type C.

2.3 GYPSUM PANELS FOR EXTERIOR

A. Sheathing/Soffit: For exterior walls and soffits.

Specified	NATIONAL GYPSUM COMPANY	Gold Bond "eXP Fire-Shield"
Acceptable alternate	PABCO BUILDING PRODUCTS	"Glass Sheathing Type X"
Acceptable alternate	UNITED STATES GYPSUM COMPANY	Securock "Glass-Mat Sheathing Firecode X"

1. Fiberglass mat laminated to both sides.
2. Core: 5/8" Type X.
3. Standard: ASTM C 1177 "Standard Specification for Glass-Mat Gypsum Substrate for use as Sheathing."
4. Surface Burning Characteristics: ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials": Flame Spread 0, Smoke Developed 0.
5. Long Edges: Square.
6. Size: 5/8 inch thick by maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Roof Board

Specified	GEORGIA-PACIFIC BUILDING PRODUCTS	"DensDeck" or "DensDeck Prime"
Acceptable alternate	NATIONAL GYPSUM COMPANY	"DEXcell" or "DEXcell FA"
Acceptable alternate	UNITED STATES GYPSUM COMPANY	Securock "Gypsum Fiber Roof Board"

1. Thickness 5/8 inch.
2. Surfacing: Glass Mat.
3. Flute-span Capability: 5/8 inch thick: 8 inches per ASTM E 661 "Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads."
4. R Value: 0.67 per ASTM C 518 "Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus."
5. Water Absorption: 10.0 per ASTM C 473 "Test methods for Physical Testing of Gypsum Panels and Products."
6. Compression Strength: 500-900 psi normal.
7. Surface Water Absorption: 2.5 grams, nominal per ASTM C 473 "Test methods for Physical Testing of Gypsum Panels and Products."
8. Surface Burning Characteristics: ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials": Flame Spread 0, Smoke Developed 0.
9. Mold Resistance: 10 per ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber."

2.4 FURRING FOR GYPSUM BOARD

- A. Metal Angles: 24 gage galvanized steel.
 1. 1-3/8 inch x 7/8 inch 190 lbs./1000 feet weight.
- B. Cold Rolled Channels: 16 gage galvanized steel.
 1. For furred walls and ceilings:
 - a. 3/4 inch x 1/2 inch flange: 300 lbs./1000 feet weight.
 - b. 1-1/2 inch x 17/32 inch flange: 500 lbs./feet weight.
 - c. 2 inch x 17/32 inch flange: 590 lbs./1000 feet weight.

- C. Resilient Channels (USG's RC-1): 25 gage corrosion resistant steel.
 - 1. Pre-punched holes at 4 inches on center in the flange to facilitate screw attachment into framing. For improving sound transmission loss through framed partitions and ceilings.
 - a. 1/2 inch flange x 2-1/2 inch overall w/1-1/2 inch offset flange x 1/2 inch offset: 200 lbs./1000 feet weight.
- D. Zee Channels: 24 gage corrosion resistant steel.
 - 1. 1 inch thick x 7/8 inch x 1-1/4 inch 224 lbs./1000 feet weight.
 - 2. 1-1/2 inch x 7/8 inch x 1-1/4 inch 269 lbs./1000 feet weight.
 - 3. 2 inch x 7/8 inch x 1-1/4 inch 313 lbs./1000 feet weight.
 - 4. 3 inch x 7/8 inch x 1-1/4 inch 400 lbs./1000 feet weight.
- E. Hat Channels:
 - 1. 7/8 inch x 2-9/16 inch 276 lbs./1000 feet weight (25 gage).
 - 2. 7/8 inch x 2-9/16 inch 515 lbs./1000 feet weight (20 gage).
- F. Channel Clips:
 - 1. Pre-formed galvanized wire used for attaching metal furring channels to cold rolled channels and single gypsum panel systems only.
 - a. 1-1/2 inch x 2-3/4 inch 38 lbs./1000 feet weight.

2.5 SUSPENSION SYSTEMS FOR GYPSUM BOARD

- A. Suspension System Design Requirements: In accordance with allowable values and properties assigned and approved by CBC.
 - 1. Lateral Load Design: ASCE 7, Chapter 13.
 - 2. Design Weight for lateral loads: Total Weight does not exceed 4 pounds per square foot, including air conditioning grilles and light fixtures.
 - 3. System is not to support lateral loads from partitions.
 - 4. Fasteners into concrete must be capable of sustaining, without failure, a load equal to 200 lbs. tension for hanger wires and 440 lbs. tension for bracing wires.
 - 5. Gypsum board suspended ceiling systems shall not support materials or building components other than grills, light fixtures, small electrical conduits, small ducts and the like.
 - a. All such components shall be supported either directly from main runners, or by supplemental framing, which is supported by main runners.
 - b. No vertical loads other than gypsum board dead load shall be applied to cross-furring.
- B. Angles, Channels, Anchors and Wires
 - 1. General: Comply with ASTM C754 "Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products," for conditions indicated.
 - 2. Wires: ASTM A641 "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire," Class 1 zinc coating, soft temper:
 - a. Tie: 0.0625-inch diameter wire (16 gage), or double strand of 0.0475 inch diameter (18 gage) wire.
 - b. Hanger: 0.162-inch diameter (8 gage).
 - c. Brace: 0.106-inch diameter (12 gage).
 - 3. Anchors:
 - a. General: Fabricate from corrosion-resistant material with holes or loops for attaching hanger and brace wires.
 - b. Ceiling Clips: 3/4-inch-wide x 0.0934 inch galvanized sheet (13 gage).
 - c. Steel Straps:
 - 1) 1-inch-wide x length as required x 0.108 inch galvanized sheet (12 gage).
 - 2) 3 inches wide x 4 inches long x 0.108-inch galvanized sheet (12 gage).

4. Main Runners:
 - a. Hot Rolled Channels: 1-1/2 inch web x 1/2 inch flange x 1/8 inch thick 1,120 lbs./1000 feet weight.
5. Cross Furring:
 - a. Hat Channels: 7/8-inch-thick x 2-9/16 inch 276 lbs./1000 feet weight.

C. Compression Struts (Metal angles, galvanized steel):

1. 1/8-inch-thick x 1 inch x 1 inch 800 lbs./1000 feet weight.
2. 3/16-inch-thick x 1-1/4-inch x 1-1/4 inch 1,480 lbs./1000 feet weight.
3. 3/16-inch-thick x 1-1/2-inch x 1-1/2 inch 1,800 lbs./1000 feet weight.
4. 3/16-inch-thick x 1-3/4-inch x 1-3/4 inch 2,120 lbs./1000 feet weight.
5. 3/16-inch-thick x 2-inch x 2 inch 2,440 lbs./1000 feet weight.
6. 3/16-inch-thick x 2-inch x 2-1/2 inch 3,070 lbs./1000 feet weight.
7. 3/16-inch-thick x 3-inch x 3 inch 3,710 lbs./1000 feet weight.
8. 1/4-inch-thick x 3-1/2-inch x 3-1/2 inch 5,800 lbs./1000 feet weight.
9. 1/4-inch-thick x 4-inch x 4 inch 6,600 lbs./1000 feet weight.
10. Alternate Compression Struts Refer to drawings.
 - a. Must be submitted to and approved by DSA.

2.6 AUXILIARY MATERIALS

A. Gypsum Board Metal Accessories:

Specified	CLARK DIETRICH BUILDING SYSTEMS, LLC (CDBS)
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Acceptable alternate	UNITED STATES GYPSUM COMPANY
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1. Corner Beads:
 - a. Outside Corner, 1-1/4-inch x 1-1/4 inch galvanized: CDBS / USG "Dur-A-Bead" #103.
2. Edge Trim:
 - a. "U"-Shaped 1 inch galvanized CDBS / USG #200-A, size to fit gypsum board.
 - b. "L"-Shaped 1 inch galvanized CDBS / USG #200-B, size to fit gypsum board.
 - 1) When "U"-Shaped molding above cannot be used.
3. Control Joint:
 - a. 1-3/4" wide, 1/4" wide center channel with removable tape strip:
 - 1) CDBS / USG #093.
4. Reveal Moldings (Aluminum Trim):

Specified	FRY REGLET
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5. Reveal Molding Sized to fit gypsum board.
6. "L" Trim Molding Sized to fit gypsum board.
7. "F" Reveal Molding Sized to fit gypsum board.
8. Snap-In Reveal Sized to fit gypsum board.
9. "Z" Reveal Molding Sized to fit gypsum board.
10. Reveal Channel Screed Sized to fit gypsum board.
11. "F" Reveal Sized to fit gypsum board.
12. "T" Molding Sized to fit gypsum board.

B. Joint Reinforcement Tape and Joint Compounds:

1. In accordance with ASTM C 474 "Standard Test Methods for Joint Treatment Materials for Gypsum Board Construction" and C 475 "Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board," and Gypsum Board Manufacturer's written recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

2. Joint Tapes:
 - a. Paper reinforcing tape, unless otherwise indicated.
3. Polymer-coated, open glass-fiber mesh for cementitious backer units.
4. Setting-Type Joint compounds for gypsum board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
 - a. When used for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
 - b. When used for pre-filling gypsum board joints, use formulation recommended by gypsum board manufacturer for this purpose.
 - c. When used for filling joints and treating fasteners of moisture-resistant gypsum board behind base for ceramic tile, use formulation recommended by the gypsum board manufacturer for this purpose.
 - d. When used for topping compound, use sandable formulation.

C. Gypsum Board Finishing Products:

1. **Skim Coat:** Thin coat of joint compound applied at a trowel consistency applied in accordance with manufacturer recommendations.
2. **Prep. Coat:** Preparation coat over gypsum board surfaces to be finished with texture.

Specified	WESTPAC MATERIALS	"Prep Tex" or "Prep Coat"
Acceptable alternate	UNITED STATES GYPSUM COMPANY	Sheetrock "First Coat Primer"
3. **Primer-Surfacer:** Material manufactured especially for the purpose of a skim coat over the entire surface over gypsum board.

Specified	UNITED STATES GYPSUM COMPANY	"Tuff-Hide"
4. **Textured Finish:** Products selected by the Contractor subject to the approval of the Architect.

D. Soundboard per Section – INSULATION.

E. Acoustical Sealant per Section – SEALANTS.

F. Firestopping per Section – FIRESTOPPING.

G. Smoke and fire per Section – SEALANTS.

H. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting setting materials, or of damaging gypsum panels or accessories.

2.7 ACCESSORIES

A. Fasteners At Gypsum Panels:

1. Nails: In accordance with CBC Chapter 7 and ASTM C 514 "Standard Specification for Nails for the Application of Gypsum Board."
2. Screws: In accordance with CBC Chapter 7, ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs," type S, G, and W, and ASTM C 954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness," Type S-12.
 - a. Provide "Bugle Head" screws that help prevent damage to gypsum core and face paper.
3. Adhesives: Per ASTM C 475 "Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board" and ASTM C 557 "Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing."
 - a. Commercial adhesives bridging minor irregularities in the base or framing at "non-fire-rated" construction.

B. Fasteners At Suspension Systems:

1. Wood Construction:
 - a. Eye screws, minimum 1/4 inch diameter, 1-1/4 inch minimum embedment.
 - b. Staples: 1-1/2 inch x 0.148 inch diameter (9 gage).
 - c. Nails: "STRONGHOLD-J" nails.
2. Steel Framing:
 - a. Shot-in Anchors.
 - b. Metal Deck or Metal Deck without Structural Concrete:
 - c. Screws, self-tapping, minimum #8 x 1/2 inch.
3. Metal Deck with Structural Concrete or Structural Concrete:
 - a. Drilled-in Anchors, 5/16 inch diameter minimum at hanger and bracing wires.
 - b. Shot-in Anchors, 3/4 inch minimum penetration at hanger wires only.

C. Other Accessories:

1. All other miscellaneous materials, not specifically described, but required for a complete and proper installation of gypsum panels, shall be as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION**3.1 EXAMINATION****A. Verification of conditions:**

1. Examine substrates, areas, and conditions, with Installers present, for compliance with requirements and other conditions affecting performance of the Work.
2. In case of discrepancy, notify the Architect at once. Do not continue with application in area of discrepancy until all such discrepancies have been fully resolved.
3. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
4. Execution of work indicates acceptance of existing conditions.

3.2 PREPARATION**A. Coordination:**

1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
2. Coordinate proper placement of ceiling mounted tracks, accessories, light fixtures, HVAC, registers and other items, which are to be integrated with gypsum board ceilings.

B. Protection:

1. Do not begin work until all rooms have been protected against the weather, and the building is covered and fully enclosed. Wet gypsum board after installation shall be removed and replaced at no extra cost to the Owner.
2. Remove and replace wet gypsum board after installation at no extra cost to the Owner.
3. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.

C. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.

3.3 INSTALLATION**A. General:**

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
 2. In accordance with Regulatory Requirements.
 - a. DSA's IR 25-3 "Suspended Gypsum Board Ceiling."
 3. Set plumb, level, and square.
- B. Layout:
1. Lines shall be straight and true.
 2. Control Joints:
 - a. Layout in accordance with GA-234-08 for both Non-Rated and Rated wall and ceiling conditions as follows:
 - 1) Provide Control Joints at in an uninterrupted straight plane exceeding 30 ft. in length and total area between control joints, such that no area exceeds 900 sq. ft.

3.4 INSTALLATION OF SUSPENSION SYSTEM

- A. Suspension System Installation: In accordance with DSA's IR 25-3.
- B. Hanger and Main Runner Installation:
1. Vertical hanger wires shall be #8 gage and galvanized; use #12 gage wire in "non-accessible" ceiling areas.
 2. Hanger spacing shall be 4'-0" o.c. with 1-1/2 inch hot rolled main runners (weighing 1.12 lbs./ft.).
 3. Bracing assemblies shall not be greater than a 12' by 12' on center spacing.
 - a. Provide bracing assemblies at locations not more than 1/2 the spacing given above, from each perimeter wall and at edge of vertical ceiling offsets.
 - b. The slope of these wires shall not exceed 45 degrees from the plane of the ceiling and shall be taut. Splices in bracing wires are not to be permitted without special DSA approval.
 - c. Ceiling grid members may be attached to not more than two (2) adjacent walls. Ceiling grid members shall be at least 1/2" free of other walls.
 - d. If walls run diagonally to ceiling grid system runners, one end of main and cross runners shall be free, and a minimum of 1/2" clear of wall.
 - e. Suspended ceiling systems with an area of 144 square feet or less, and fire rated ceiling systems with an area of 96 square feet or less, surrounded by walls which connect directly to the structure above, do not require bracing assemblies when attached to at least two adjacent walls.
 4. Fasten hanger wires with not less than three tight turns.
 - a. Fasten bracing wires with not less than four tight turns.
 - b. Make all tight turns within a distance of 1-1/2 inches.
 - c. Hanger or Bracing Wire anchors to the structure shall be installed in such a manner that the direction of the wire aligns as closely as possible with the direction of the forces acting on the wire.
 - 1) Wire turns made by machine where both strands have been deformed or bent in wrapping can waive the 1-1/2" requirement, but the number of turns shall be maintained, and be as tight as possible.
 - d. Separate all ceiling and bracing wires at least six inches (6") from all unbraced ducts, pipes, conduit, etc. It is acceptable to attach lightweight items, such as single electrical conduit not exceeding 3/4" nominal diameter, to hanger wires using connectors acceptable to DSA.
 5. Hangers shall be saddle-tied around main runners to develop the full strength of the hangers.
 6. Main Runners shall be spliced by lapping and interlocking flanges 12 inches minimum and tying near each end with double loops of #16 gage wire.

7. Provide trapeze or other supplementary support members at obstructions to typical hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or discontinuous areas. Hanger wires that are more than 1 in 6 out of plumb shall have countersloping wires.
8. All recessed or drop-in light fixtures, as well as ceiling mounted mechanical air terminals and services, shall be supported directly by main runners or by supplemental framing which is supported by main runners and positively attached with screws or other approved connectors.
9. Surface mounted fixtures shall be attached to a main runner with a positive clamping device made of material with a minimum of 14 gage. **ROTATIONAL SPRING CLAMPS DO NOT COMPLY.**

C. Cross-Furring:

1. Cross-Furring shall be 7/8 inch, 25 gage galvanized hat sections at 24 inches on center maximum.
2. Cross-Furring shall be saddle-tied to the main runners with one strand of #16 gage, or two strands of #18 gage tie wire.
3. Cross-Furring shall be spliced by lapping and interlocking the pieces eight inches minimum and tying near each end with double loops of #16 gage wire.

D. Furring Channels:

1. Attach hat channels at 16" o.c. to framing members at 24" o.c. maximum with one 1-1/2" Type "G" screw at each bearing point. Stagger screws to opposite sides at every bearing surface.

3.5 INSTALLATION OF INTERIOR GYPSUM BOARD

A. General:

1. During Winter Weather Installation periods, follow the GA-220 GYPSUM BOARD WINTER RELATED INSTALLATION RECOMMENDATIONS.

B. Where sound, smoke control or fire-ratings are required, details of construction shall be in accordance with reports of tested assemblies meeting the requirements.

C. Install in accordance with CBC Chapter 25, DITF and GA recommendations, gypsum board panel manufacturer's written recommendations and in accordance with fire-rated design numbers.

1. At Ceilings and Soffits:

- a. At gypsum board ceilings and soffit areas, install the ceiling prior to installing the walls.
- b. Float the interior ceiling angles, and where permitted by code,

2. At Sound and Acoustical Walls:

- a. Set all gypsum board panels on each side of the partition in a continuous 1/4 inch bead of acoustical sealant furnished and installed in accordance with the provisions of Specification Section -- SEALANTS.

3. At Moisture Resistant Walls:

- a. Install where scheduled and in all areas where high moisture conditions are present, or ceramic tile, or wall coverings are scheduled over gypsum board.
- b. In all areas to be tiled, treat all edges, cutouts, utility holes and joints, corners and nailheads with an approved sealant material in lieu of standard taping. Joints not to be covered by tile shall be treated as regular gypsum board. Do not use standard joint compound under ceramic tile.

4. At Sheathing:

- a. Screw-attach sheathing to exterior of each stud with 1" Type "S-12" corrosion resistant screws spaced 3/8" from ends and edges and approximately 8" o.c. Apply sealant around sheathing perimeter at interface with other materials and install flashing.

- D. Install gypsum board panels horizontally on walls, floor to ceiling.
- E. At metal frames terminate wall board panel edge inside frame. Do not terminate gypsum board panel edge against metal frame trim unless otherwise indicated.
- F. Cutting:
 - 1. Cut gypsum board panels by scoring and breaking or by sawing, working from the face side.
 - a. When cutting by scoring, cut through the face paper and then snap the panel back away from the cut face; then break the backpaper by snapping the panel in the reverse direction or by cutting the back paper.
 - 2. Smooth all cut ends and edges of panels as necessary to obtain a smooth joint.
 - 3. For cut-outs in panels for pipes, fixtures, and other small openings, make holes and cut-outs by sawing or by such other method as will not fracture the core or tear the covering and with such accuracy that plates, escutcheons, or trim will cover the edges.
 - 4. The use of "score-and-knockout" method will not be permitted.

3.6 INSTALLATION OF METAL ACCESSORIES

- A. Corner Beads:
 - 1. Install at all corners with galvanized screws at nine (9) inch intervals in both flanges with fasteners placed opposite one another the full length of the corner bead. Clinch-on fastening is not allowed.
 - a. Fasteners shall be driven below the anticipated finished joint compound surface.
 - 2. Install in one piece except when length of corner exceeds stock lengths – then put splice up high away from people traffic.
- B. Edge Trim: Install at all exposed joints where gypsum board panels abut another material with galvanized screws at nine (9) inch intervals the full length of the edge trim. Clinch-on fastening is not allowed.
 - 1. Fasteners shall be driven below the anticipated finished joint compound surface.
 - 2. Provide joint sealer in accordance with Specification Section -- SEALANTS.
 - a. Provide fire sealant in accordance with Specification Section -- FIRSTOPPING or Specification Section -- SEALANTS, when the wall or ceiling is part of a fire-rated situation.
- C. Control Joints:
 - 1. Install at 30'-0" o.c. maximum at all interior walls or partitions with uninterrupted planes that exceed 30' in length.
 - a. Opening frames that are full height of wall or partition may be considered a control joint.
 - 2. Install at 50'-0" o.c. maximum at all interior ceilings and shall not exceed 2,500 sq.ft. in total area with perimeter relief.
 - 3. Install at 30'-0" o.c. maximum at all interior ceilings and shall not exceed 900 sq.ft. in total area without perimeter relief.
- D. Exterior Trim:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.
- E. Fastening:
 - 1. Properly space all fasteners in careful accordance with the manufacturer's written recommendations and code requirements, with heads driven slightly below the surface for proper cementing, but without breaking the paper face.
 - 2. Loosely butt all joints to be taped; firmly butt all joints to be left untreated.
 - 3. Stagger all end joints and the joints between panels to achieve a maximum of bridging and a minimum of continued joints.

3.7 INSTALLATION OF EXTERIOR GYPSUM PANELS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 - 1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
 - 2. Fasten with corrosion-resistant screws.
 - 3. Screw-attach sheathing to exterior of each stud with 1" Type "S-12" corrosion resistant screws spaced 3/8" from ends and edges and approximately 8" o.c. Apply sealant around sheathing perimeter at interface with other materials and install flashing.

3.8 FINISHING OF GYPSUM BOARD

- A. General:
 - 1. Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
 - 2. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- B. Taping and Finishing:
 - 1. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
 - 2. First Coat:
 - a. Spread compound evenly over all joints, using suitable tools designed for the purpose.
 - b. Fill all joint recesses and metal trim.
 - c. Center the reinforcing tape on the joint and press into the fresh compound at all joints, wiping down with sufficient pressure to remove excess compound but leaving sufficient compound under the tape for proper bond.
 - d. Feather all edges and leave the surface free from blisters and tape wrinkles.
 - e. Apply compound to all fastener recesses, leaving flush with the adjacent surfaces.
 - f. Fold reinforcing tape along its centerline and apply to all interior angles, following the same procedure as for joints.
 - g. Surfaces shall be free of excess joint compound.
 - 3. Second Coat:
 - a. Lightly sand the dry compound with fine sandpaper to remove all irregularities.
 - b. Apply a second coat of compound to all joints, feathering approximately three inches beyond edges of tape.
 - c. Apply second coat to all fastener recesses.
 - d. Surface shall be smooth and free of tool marks.
 - 4. Third Coat:
 - a. Lightly sand the dry compound with fine sandpaper to remove irregularities.
 - b. Apply third coat of compound to all joints, feathering out approximately two inches beyond second coat.
 - c. Third coat all fastener recesses and metal trim, and all interior angles; allow to dry.
 - d. Surface shall be smooth and free of tool marks.
- C. Primer-Surfacer (Manufactured Skim Coat):
 - 1. Durable, high build, low sag drywall surfacer used prior to painting to minimize pattern variation.
 - 2. Abrasion resistant.
 - 3. Material coverage: approx. 80-110 sq ft per gallon when applied at 15-20 wet film thickness. Full coat coverage is required.
 - 4. Application: airless sprayer. If touch-up sanding is required, sand with 220 grit mesh screen.
 - 5. Prime exposed metal trim pieces before application.

6. Refer to manufacturer's written recommendations.
- D. Prep. Coat (Drywall Primer):
 1. Use prior to application of texture to minimize texture pattern variation.
 2. Material coverage: approx. 180-200 sq ft per gallon when applied at 8-10 wet film thickness. Full coat coverage is required.
 3. Application: airless sprayer.
 4. Prime exposed metal trim pieces before application.
 5. Refer to manufacturer's written recommendations.
- E. Application of Texture Finishes:
 1. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
 2. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
 3. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

- A. Marking and Identification:
 1. Where there is an accessible concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling in the concealed space and shall comply with all of the following:
 - a. Be located in accessible concealed floor, floor/ceiling, or attic spaces.
 - b. Be located within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
 - c. Include lettering not less than 3 inches in height with a minimum 3/8 inch stroke in a contrasting color identifying the wall type and its fire-resistance rating.
 - 1) "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS," or other wording.
- B. Site Tests:
 1. Testing Agency: The Owner's Testing Laboratory Agency shall perform field tests and Inspections and prepare test reports.
 - a. Testing and inspecting of completed installations of suspended gypsum board ceiling fasteners and anchors shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of gypsum board ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
 2. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed:
 - a. Concrete Anchors:
 - 1) Must be capable of sustaining, without failure, a load equal to 200 lbs. tension for hanger wires and 440 lbs. tension for bracing wires by construction as determined by testing according to ASTM E 488 "Test Methods for Strength of Anchors in Concrete and Masonry Elements," by a qualified independent testing agency.
 - a) Hanger Wire Anchors 1 in 10 must be field tested.
 - b) Bracing Wire Anchors 1 in 2 must be field tested.

3. Remove and replace gypsum board ceiling hangers where test results indicate that they do not comply with specified requirements.
4. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - a. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors of previously tested until 20 pass consecutively and then will resume initial testing frequency.

C. Inspection:

1. As required by Regulatory Requirements.
2. Schedule inspections and notify the Architect, Project Inspector and any other regulatory agencies of the time at least 48 hours prior to the inspection.
3. No work shall be without the inspections required by Regulatory Requirements.

3.10 CLEANING

A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.

1. Clean any soiled surfaces immediately.
2. Clean any soiled surfaces at the end of each day, minimum.
3. Finish shall be clean and ready for the application of any additional finishes.
4. In accordance with manufacturer's written instructions and recommendations.

3.11 PROTECTION

A. Protection from weather:

1. Protect newly installed work from moisture after installation.

B. Protection from traffic:

1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.

3.12 SCHEDULES

A. Apply the following finishes to the board surfaces prior to covering with other finish materials.

1. Refer to the Interior Finish Schedule for finish locations.
2. **GB-X:** Architect's Finish Designation.
3. Level X: ASTM C840 "Standard Specification for Application and Finishing of Gypsum Board," modified per Architect's Finish Designation.
4. Where no finish is indicated on the drawings, select the appropriate finish from the descriptions below or provide GB-2 (minimum).

B. **GB-1** (Level 5, modified): Uniformly smooth surface; exposed to view.

1. Embed tape in joint compound at all joints and interior angles.
2. Apply 2 separate coats of joint compound over all flat joints and 1 separate coat of joint compound over interior angles.
3. Cover fastener heads and accessories with 3 separate coats of joint compound.
4. Joint compound surfaces shall be smooth and free of tool marks and ridges.
5. Apply primer-surfacer to the entire surface.
6. Painting system and its application to surfaces per Specification Section – PAINTING.

C. **GB-2** (Level 4, modified): Textured surface; exposed to view.

1. Embed tape in joint compound at joints and interior angles.
2. Apply 2 separate coats of joint compound over all flat joints and 1 separate coat of joint compound over interior angles.
3. Cover fastener heads and accessories with 3 separate coats of joint compound.
4. Joint compound surfaces shall be smooth and free of tool marks and ridges.
5. Apply prep coat to the entire surface.
6. Apply texture: Light orange peel. [Modernization Projects: Match existing texture.]

7. Painting system and its application to surfaces per Specification Section – PAINTING.
- D. **GB-3** (Level 2): Substrate for thin set tile, acoustical panels, tackboard, FRP, wood panels.
1. Embed tape in joint compound at all joints and interior angles. Wipe with a joint knife leaving a thin coating of joint compound over all joints and interior angles.
 2. Cover fastener heads and accessories with a coat of joint compound.
 3. Tool marks and ridges are acceptable.
- E. **GB-4** (Level 3): Smooth surface; substrate for wallcoverings.
1. Embed tape in joint compound at joints and interior angles.
 2. Apply 1 additional coat of joint compound over all joints and interior angles.
 3. Fastener heads and accessories shall be covered with two separate coats of joint compound.
 4. Joint compound shall be smooth and free of tool marks and ridges.
- F. **GB-5** (Level 1): Concealed from view.
1. Embed tape in joint compound at joints and interior angles.
 2. Surface shall be free of excess joint compound.

END OF SECTION

SECTION 09 30 00 - TILE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all tile materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 30 00 CAST-IN-PLACE CONCRETE
 - 4. 06 10 00 ROUGH CARPENTRY
 - 5. 07 92 00 SEALANTS
 - 6. 09 22 16 METAL FRAMING
 - 7. 09 29 00 GYPSUM BOARD
 - 8. 09 68 40 CARPET
 - 9. 11 40 00 FOOD SERVICE EQUIPMENT
 - 10. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. ADAAG Americans with Disabilities Act Accessibilities Guidelines
 - b. ADAS Americans with Disabilities Act Standards
 - c. ANSI American National Standards Institute, Specifications for the Installation of Ceramic Tile, latest edition, unless otherwise indicated.
 - d. FDA Food and Drug Administration
 - e. TCNA Tile Council of North America "Handbook for Ceramic Tile Installation"

1.3 DEFINITIONS

- A. Definitions shall comply with the latest edition of the TCNA "Handbook for Ceramic Tile Installation."
 - 1. MOH's: Relative Measure of Hardness by scratching the surface of the tile with different minerals and subjectively assigning a "MOH's Scale Hardness" number to the glaze.

1.4 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data:
 - a. For each type of Tile indicated.
 - b. Manufacturer's full color range (including any standard and premium colors).
 - c. Design Data for components, fillers, adhesives, etc.
 - 2. Shop Drawings:
 - a. Location of all movement/expansion joints.
 - 3. Samples:
 - a. 12-inch square sample of each color and pattern selected.
 - b. 6-inch lineal samples of each piece of trim material specified.

4. Quality Assurance/Control Submittals:
 - a. Test Reports:
 - 1) From Manufacturer that all floor tile complies with the slip resistance standards recommended by the ADAAG/ADAS.
 - b. Certificates:
 - 1) Provide TCNA Master Grade Certificate.
 - c. Manufacturer's Written Installation Instructions.
 - d. Statement of Installer's Qualifications.
5. Closeout Submittals in accordance with the following:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Warranty in accordance with this specification, and with Specification Section - WARRANTIES.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 1. Material Qualifications:
 - a. Tile Grade: Standard Grade in accordance with ANSI A 137.1x.
 - b. Tile shall meet the Breaking Strength limits listed in accordance with ASTM C 648 "Test Method for Breaking Strength of Ceramic Tile."
 - c. Tile shall meet the Scratch Hardness limits in accordance with MOH's
 - d. TCNA Master Grade Certificate signed by tile manufacturer and tile installer.
 2. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
- B. In accordance with Specification Section - REGULATORY REQUIREMENTS.
 - a. CBC California Building Code (CBC 804.1)
- C. Meetings:
 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - c. Review delivery, storage, and handling procedures.
 - d. Review Project Conditions.
 - e. Review subfloor preparation procedures.
 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, handling, and unloading:
 1. Products shall be handled in such a manner as to assure that they are free from dents, chips, scratches and other damage.
- B. Acceptance at Site:
 1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
 2. Damaged products will not be accepted.

C. Storage and protection:

1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.
 - a. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.

1.7 PROJECT CONDITIONS

A. Environmental requirements:

1. Temperature:
 - a. Maintain temperature in space to receive ceramic tile above 50 degrees F for 3 days prior, during, and 7 days following installation.

B. Existing Conditions:

1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
2. Field Measurements:
 - a. Take and be responsible for field measurements as required.
 - b. Report any significant differences between field dimensions and drawings to the Architect.

1.8 WARRANTY

A. Contractor's General Warranty:

1. In accordance with Specification Section - WARRANTIES.

B. Manufacturer's Warranty:

1. In accordance with manufacturer's written standard warranty,
2. Warranty Period shall be for the following:
 - a. Interior Ceramic Tile One (1) Year.

C. Installer's Warranty:

1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period: One (1) Year.

1.9 MAINTENANCE

A. Extra Materials:

1. Maintenance Material:
 - a. In accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Supply 2 square feet of tile and 3 lineal feet of trim for each color and pattern of tile

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.

1. Interior Ceramic Tile manufacturer:
 - a. DALTILE.
 - b. Acceptable alternative manufacturers:
 - 1) CROSSVILLE CERAMICS.
 - 2) INTERCERAMIC.
 2. Grout Materials manufacturer:
 - a. MAPEI.
 - b. Acceptable alternative manufacturers:
 - 1) CUSTOM BUILDING PRODUCTS, INC.
 - 2) LATICRETE.
 3. Mortar Materials manufacturer:
 - a. MAPEI.
 - b. Acceptable alternative manufacturers:
 - 1) CUSTOM BUILDING PRODUCTS, INC.
 - 2) LATICRETE.
 4. Admixture manufacturer:
 - a. MAPEI "Plancrete AC."
 5. Metal Trim manufacturer:
 - a. SCHLUTER SYSTEMS.
 6. Membranes manufacturer:
 - a. THE NOBLE COMPANY.
 - b. Acceptable alternative manufacturers:
 - 1) DALTILE.
 - 2) INTERCERAMIC.
 7. Cementitious Backer Units manufacturer:
 - a. USG CORPORATION "DUROCK Cement Board"
 - b. Acceptable alternative manufacturers:
 - 1) C-CURE "C-Cure Board 990"
 - 2) CUSTOM BUILDING PRODUCTS "Wonderboard"
 - 3) FINPAN, INC. "Util-A-Crete Concrete Backer Board"
 8. Sealer manufacturer:
 - a. CUSTOM BUILDING PRODUCTS Tile Lab "Surface Gard Penetrating Sealer"
 - 1) Acceptable alternative manufacturers:
 - a) C-CURE "Penetrating Sealer #978"
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. General:
1. Slip Resistance:
 - a. Level Surfaces:
 - 1) Static Coefficient of Friction (SCOF): Tile installed on level walkway surfaces shall be slip resistant by achieving a minimum 0.6 or greater static coefficient of friction as recommended in Appendix A4.5 of the ADAAG by testing per ASTM C 1028 "Test method for Static Coefficient of Friction of Ceramic Tile and Like Surfaces by the Horizontal Dynamometer Pull Meter Method."

- 2) Dynamic Coefficient of Friction (DCOF): Tile installed on level walkway surfaces shall be slip resistant by achieving a minimum 0.42 or greater dynamic coefficient of friction as recommended in ADAS per TCNA technical bulletin "Coefficient of Friction and the DCOF AcuTest," by testing per ANSI A 137.1 "American National Standard Specifications for Ceramic Tile," section 9.6 "Procedure for Dynamic Coefficient of Friction (DCOF) Testing."
 - b. Ramps:
 - 1) Tile installed on ramps shall achieve a minimum 0.8 or greater static coefficient of friction as recommended in Appendix A4.5 of the ADAAG by testing per ASTM C 1028 "Test method for Static Coefficient of Friction of Ceramic Tile and Like Surfaces by the Horizontal Dynamometer Pull Meter Method."
 2. Colors and patterns shall be selected from manufacturer's standard line (including premium), except as noted otherwise.
- B. Ceramic:
1. Interior Floor Tile **CT-1.**
 - a. Manufacturer: DALTILE.
 - 1) Stagecraft, Kaleidoscope Mosaic Undulated
 - 2) Trim to match.
 - a) Tile Trim Units: Provide tile trim units (i.e. "bullnoses," "thin-set bullnoses," "coves," "thin-lip bases," "round top bases," "beads," and "countertop edge trims" as is appropriate to tile types) to match characteristics of adjoining flat tile.
 - b. Design: 6" x 6" x 1/4" thick
 - c. Pattern: Any combination thereof of the sizes listed above, to be back/edge mounted on manufacturers strong, flexible 12" x 15" Sheet
 - d. Grout joint width: 1/8".
 - e. Color: Shall be selected in any combination thereof from manufacturer's full range of color.
 - f. Material: Glazed Ceramic Mosaics.
 - 1) Water Absorption: less than 3 percent.
 - 2) Breaking Strength: greater than 120-230 lbs.
 - 3) Chemical Resistance: Resistant.
 - 4) Bond Strength: greater than 65 psi.
 - 5) Coefficient of Friction: greater than or equal to 0.60.
- C. Setting Bed:
1. Thick-Set:
 - a. Portland Cement: In accordance with ASTM C 150 "Specification for Portland Cement," Type 1.
 - b. Sand (Aggregate): In accordance with ASTM C 144 "Standard Specification for Aggregate for Masonry Mortar."
 - c. Hydrated Lime: In accordance with ASTM C 207 "Specification for Hydrated Lime for Masonry Purposes.," Type S.
 - d. Admixture: Shall be Mortar Latex Admix "Planicrete AC" as manufactured by MAPEI, or approved equivalent.
 - 1) This Admixture serves as a replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
 2. Thin-Set:
 - a. Dry-Set Portland Cement Mortar: In accordance with ANSI A 118.1-1999.
 - 1) Shall be "Kerabond" by MAPEI, or approved equivalent for floor and wall surfaces.

- a) For wall applications, provide non-sagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.
 - b. Modified Dry-Set Cement Mortar: In accordance with A118.4TE, A118.15TE and A118.11
 - 1) Shall be "Large Floor Tile Mortar" by MAPEI, or approved equivalent.
 - a) Approved Equivalent: 'ProLite Premium Large Format Tile Mortar' by CUSTOM BUILDING PRODUCTS.
 - 2) For floor applications in which the long edge of tile exceeds 8" (large format tiles).
 - c. Latex-Portland Cement Mortar: In accordance with ANSI A 118.4-1999.
 - 1) Shall be "Keralastic" + "Kerabond" by MAPEI, or approved equivalent for floor and wall masonry or floor and wall concrete surfaces.
 - a) For wall applications, provide non-sagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.
- D. Grout:
- 1. Cement:
 - a. ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
 - 2. Commercial Cement:
 - a. ANSI A118.6, composed of Standard Sanded Cement Grout, color as indicated.
 - 3. Silicone-Rubber:
 - a. One-part, chemically curing, silicone-rubber-based elastomeric sealants used for factory-grouted joints within pre-grouted sheets of glazed wall tile and for field-grouted joints between the same pre-grouted sheet
 - 1) Silicone-Rubber grout shall not be used on kitchen countertops or other food preparation surfaces unless it meets the requirements of FDA Regulation No. 21, CFE 177.2600.
 - 4. Dry-Set:
 - a. ANSI A 108.5-1999 and ANSI A 118.1-1999, a mixture of Portland Cement with sand and additives, color as indicated.
 - 5. Epoxy:
 - a. ANSI A118.3-1999, Chemical-Resistant, Water-Cleanable, Ceramic Tile-Setting and Grouting Epoxy, color as indicated.

2.3 ACCESSORIES

- A. Metal Trim:
 - 1. Outside Wall Corner and Edges:
 - a. Manufacturer: SCHLUTER SYSTEMS, "JOLLY"
 - b. Material: Extruded Aluminum.
 - c. Finish: Natural (AN).
 - 2. Cover Base:
 - a. Manufacturer: SCHLUTER SYSTEMS, "DILEX-AHKA"
 - b. Material: Extruded Aluminum.
 - c. Finish: Natural (AN).
- B. Membranes:
 - 1. Wall:
 - a. Polyethylene, 4 mil sheet with 6 inch laps at wet areas.
 - b. Polyethylene, 6 mil sheet with 6 inch laps at shower areas adjacent to concrete or masonry wall areas.
 - 2. Floor:

- a. Mortar bed: Nonplasticized, chlorinated polyethylene sheet faced on both sides with nonwoven polyester fabric; 0.040 inch nominal thickness, water vapor transmission rate 0.040 perms per ASTM E 96 "Test Methods for Water Transmission of Materials," Procedure E.
 - 1) "Chloraloy" by THE NOBLE COMPANY.
 - b. Thin-Set: Nonplasticized, chlorinated polyethylene sheet faced on both sides with nonwoven polyester fabric; 0.030 inch nominal thickness, water vapor transmission rate 0.15 perms per ASTM E 96 "Test Methods for Water Transmission of Materials," Procedure E.
 - 1) "Nobleseal TS" by THE NOBLE COMPANY.
 - 2) Approved equivalent: "Dal-Seal CIS" by DAL TILE over a skim coat of "Keralastic" + "Kerabond" by MAPEI.
- C. Cementitious Backer Units:
 - 1. Provide cementitious backer units complying with ANSI A118.9-1999, in maximum lengths available to minimize end-to-end butt joints.
 - a. Thickness: Manufacturer's standard thickness, but not less than 1/2 inch unless otherwise noted.
 - b. Width: Manufacturer's standard width, but not less than 32 inches, unless otherwise noted.
- D. Miscellaneous Materials:
 - 1. Provide miscellaneous guides, shims, spacers, rust resistant fasteners, etc., applicable to substrates and finish materials necessary for flat and true surfaces that minimize cracks, bulges and uneven surfaces.
- E. Cleaners:
 - 1. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- F. Sealers:
 - 1. Grout and Tile Sealer: Manufacturer's standard product for sealing grout joints and tile surfaces that does not change color or appearance of grout or tile.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.

- C. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Coordination:

1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
2. Prior to installation of Tile, inspect the installed work executed under other Sections which affect the installation of Tile.
 - a. Prepare masonry surfaces with a parge coat and cure so that all surfaces are flat prior to the installation of tile.

B. Protection:

1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.

C. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.
3. Fill cracks, holes, and depressions in concrete substrates for tile floors with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
4. Maximum backing surface variations shall be as follows:
 - a. Mortar Bed at Floors: 1/4 inch in 10 feet from required plane.

- D. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
2. In accordance with approved submittals.
3. In accordance with Regulatory Requirements.
4. Set plumb, level, and square.
5. Determine location of all movement/expansion joints before starting tile work.
6. Install Cementitious Backer Units in accordance with Cementitious Backer Unit Board Manufacturer's recommendations.
 - a. Shim Cementitious Backer Unit Boards as required for a flat and true surface plane with no bulges or uneven or flared surfaces.
 - b. Set shims at fasteners.
 - c. Fasten with corrosion resistant, waferhead, self-drilling screws with countersinking ribs, min. 8 gauge. Set flush with Board's surface. Fasten thru shims.
7. Determine location of all toilet accessories before starting tile work.
8. Isolate tile installations from concrete slabs at shower floor areas to minimize cracking of the tile installation systems. Install in accordance with the TCNA recommendations using cleavage membranes.
 - a. Provide crack isolation membranes as required in accordance with TCNA installation requirements.
9. Provide wall membranes as required by TCNA installation requirements.

B. Layout:

1. Lines shall be straight and true.

2. Refer to Wall and Floor Pattern Drawing(s) in the Interior and Exterior Color Schedules for layout of patterns.
 3. Lay out all tile work to minimize cuts less than one-half in size.
 4. Lay out tile wainscots to next full tile beyond dimension shown.
- C. Joints
1. General: Movement/Expansion Joints shall be placed in accordance with the TCNA recommendations for placement.
 2. Align all wall joints to give straight uniform grout lines, plumb and level.
 3. Align all floor joints to give straight uniform grout lines, parallel with walls.
 4. All joints shall be uniform in width.
 5. Locate expansion joints in the tilework:
 - a. Over construction or expansion joints in the backing.
 - b. Where backing materials change or change directions.
 - c. At wall/floor intersections.
 - d. Exterior work:
 - 1) Not more than 8 - 12 feet in each direction.
 - e. Interior work:
 - 1) Not more than 20 - 25 feet in each direction.
 - a) Interior tilework exposed to direct sunlight or moisture: 8 to 12 feet in each direction.
 - b) Above ground concrete slab substrate: 8 to 12 feet in each direction.
 6. Movement/expansion joint width sizes:
 - a. Working Butt Joints 1/4 inch minimum.
 - b. Working Lap Joints 1/8 inch minimum.
- D. Flatness and Lippage:
1. Maximum lippage between adjacent units: 1/32 inch.
- E. Tile System Installations:
1. Interior Floor:
 - a. System IFA: Concrete Sub-Floor, thin-set installation: **SYS-IFA.**
 - 1) Use: Dry or Limited water exposure.
 - 2) Method: Dry-set Mortar or Latex-Portland Cement Mortar.
 - 3) Detail Standard: TCNA F113-, 3/32" thin-set Dry-set or Latex-Portland Cement Mortar, Bond Coat, Tile, Grout.
 - 4) Installation Standard:
 - a) Tile: ANSI A 108.5.
 - b) Grout: ANSI A 108.10.
 - b. System IFB: Concrete Sub-Floor, mortar bed installation **SYS-IFB.**
 - 1) Use: Dry or Wet (Kitchens and Toilets).
 - 2) Method: Cement Mortar.
 - 3) Detail Standard: TCNA F114 - Cleavage Membrane, Reinforcing, 1-1/4" to 2"- Mortar Bed, Bond Coat, Tile, Epoxy Grout.
 - 4) Flush Grout with tile surface at kitchen floors only.
 - 5) Installation Standard:
 - a) Tile: ANSI A 108.1B.
 - b) Epoxy Grout: ANSI A 108.6.
 - c. System IFC: Concrete Sub-Floor, shower receptor mortar bed installation: **SYS-IFC.**
 - 1) Use: Wet Exposure (Showers).
 - 2) Method: Cement Mortar.
 - 3) Detail Standard: TCNA B414 - Tile or Stone, Shower Membrane, 1" to 1-3/4" Reinforced Mortar Bed, Bond Coat Tile, Grout.
 - 4) Installation Standard:
 - a) Tile: ANSI A 108.1B.

- b) Grout: ANSI A 108.10.
 - c) Shower Pan Membrane ANSI A108.01-3.6
 - d. System IFD: Concrete Sub-Floor, Cementitious Backer Installation **SYS-IFD.**
 - 1) Use: Wet Exposure (Showers).
 - 2) Method: Latex Portland Cement Mortar.
 - 3) Detail Standard: TCNA B 415 - shower floor membrane, cementitious backer unit over Wood or Metal studs or fiber cement underlayment, reinforced mortar bed, tile.
 - 4) Installation Standard:
 - a) Tile: ANSI A 108.5.
 - b) Grout: ANSI A 108.10.
 - c) Shower Pan Membrane ANSI A108.01-3.6.
- 2. Interior Wall:
 - a. System IWA: Masonry or Concrete Walls, thin-set installation **SYS-IWA.**
 - 1) Use: Dry or Limited Water Exposure (Toilets).
 - 2) Method: Cement Mortar.
 - 3) Detail Standard: TCNA W202I - 3/32" Thin-Set Mortar Bed Bond Coat, Tile, Epoxy Grout.
 - 4) Installation Standard:
 - a) Tile ANSI A 108.5.
 - b) Epoxy Grout ANSI A 108.6.
 - b. System IWB: Masonry or Concrete Walls, mortar bed installation **SYS-IWB.**
 - 1) Use: Dry or Limited Water Exposure (Toilets).
 - 2) Method: Cement Mortar, Bonded.
 - 3) Detail Standard: TCNA W211 - 3/8" to 3/4" Mortar Bed, Bond Coat, Tile, Grout.
 - 4) Installation Standard:
 - a) Tile ANSI A 108.1A, 1B, or 1C.
 - b) Grout ANSI A 108.10.
 - c. System IWC: Masonry or Concrete Walls, Mortar bed installation **SYS-IWC.**
 - 1) Use: Wet Exposure (Showers)
 - 2) Method: Cement Mortar.
 - 3) Detail Standard: TCNA W221 - Membrane, Metal Lath, 3/4" to 1 1/2" Scratch Coat and Epoxy Mortar Bed, Bond Coat, Tile, Epoxy Grout.
 - 4) Installation Standard:
 - a) Tile ANSI A 108.1B.
 - b) Epoxy Grout ANSI A 108.6.
 - c) Waterproof membrane ANSI A108.13.
 - d. System IWD: Gypsum Board Wall, thin-set installation **SYS-IWD.**
 - 1) Use: Dry Exposure.
 - 2) Method: Dry-Set or Latex-Portland Cement Mortar.
 - 3) Detail Standard: TCNA W243 - Water Resistant Gypsum Board, 3/32" Thin-Set Dry-Set or Latex-Portland Cement Mortar, Bond Coat, Tile, Grout.
 - 4) Installation Standard:
 - a) Tile ANSI A 108.5.
 - b) Grout ANSI A 108.10.
 - e. System IWD.2: Cement Backer Unit, thin-set installation **SYS-IWD.2.**
 - 1) Use: Dry Exposure.
 - 2) Method: Dry-Set or Latex-Portland Cement Mortar.
 - 3) Detail Standard: TCNA W244C – Cement Backer Board, 3/32" Thin-Set Dry-Set or Latex-Portland Cement Mortar, Bond Coat, Tile, Grout.
 - 4) Installation Standard:
 - a) Tile ANSI A 108.5.

- b) Grout ANSI A 108.10.
 - f. System IWE: Wood Stud Walls, mortar bed installation **SYS-IWE.**
 - 1) Use: Dry or Wet Exposures (Kitchen, Toilets and Showers).
 - 2) Method: Cement Mortar.
 - 3) Detail Standard: TCNA W231 - Cleavage Membrane, Metal Lath, 3/4" to 1-1/2" Scratch Coat and Mortar Bed, Bond Coat, Tile, Grout.
 - 4) Installation Standard:
 - a) Tile ANSI A 108.1B.
 - b) Grout ANSI A 108.10.
 - c) Waterproof membrane ANSI A108.13.
 - g. System IWF: Metal Stud Walls, mortar bed installation **SYS-IWF.**
 - 1) Use: Dry or Wet Exposure (Kitchen, Toilets and Showers).
 - 2) Method: Cement Mortar.
 - 3) Detail Standard: TCNA W241 - Cleavage Membrane, Metal Lath, 3/4" to 1" Scratch Coat and Mortar Bed, Bond Coat, Tile, Grout.
 - 4) Installation Standard:
 - a) Waterproof membrane ANSI A108.13.
 - b) Cured Mortar Bed.
 - c) Tile ANSI A 108.1B.
 - d) Grout ANSI A 108.10.
- 3. Sealer Application:
 - a. For tile and grout sealers, follow manufacturer's written recommendations and procedures, at application rates recommended by the label on the material container.
 - b. Apply penetrating grout sealer and cure in accordance with tile manufacturer's written recommendations for the resistance of moisture penetration into the grout surface.
 - c. For Stone Tile and Stone Grout sealers, apply at a rate of 500 to 1,500 sq. ft. per coat per gallon, depending on type of stone (slate), porosity and texture of the surface, temperature, humidity and method of application.
 - d. For exterior Stone Tile applications, provide two coats of sealer per manufacturer's written recommended rate of application, allowing the proper time between coats for curing (30 minutes) as recommended by the manufacturer.
 - 1) Protect newly coated surface from traffic and moisture for a period of twelve hours.
- F. Curing:
 - 1. Apply Curing Sheet over all tiled surfaces.
 - a. Lap sheets 4 inches minimum and seal against escape of moisture.
 - b. Leave Curing Sheets in place a minimum of 3 days.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Clean any soiled surfaces immediately.
- C. Finish shall be clean and ready for the application of any additional finishes.
- D. In accordance with manufacturer's written instructions and recommendations.
- E. Wash down cured tile work with cleaner mixed and applied in accordance with manufacturer's written instructions.
- F. Rinse tile-work thoroughly, with clean water, and polish with soft-cloth.

3.5 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Protect newly installed work from freezing for 24 hours after erection, installation or application.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.

END OF SECTION

SECTION 09 50 00 – ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all Acoustical Ceiling Materials, Suspension Systems, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 05 12 00 STEEL AND FABRICATIONS
 - 4. 06 10 00 ROUGH CARPENTRY
 - 5. 07 21 00 INSULATION
 - 6. 09 22 16 METAL FRAMING
 - 7. 09 29 00 GYPSUM BOARD
 - 8. 09 91 00 PAINTING
 - 9. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 10. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. CISCA Ceilings & Interior Systems Construction Association.

1.3 SYSTEM DESCRIPTION

- A. Suspension System Design Requirements: In accordance with allowable values and properties assigned and approved by CBC.
 - 1. Heavy Duty in accordance with ASTM C 635 "Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and lay-in Panel Ceilings," ASTM E 580 "Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint," Section 5.1, ASCE 7 as modified by CBC Sections 1617A.1.21, 2506.2.1, and DSA IR 25-2.
 - 2. Design Weight: Total Weight does not exceed four (4) pounds per square foot, including air conditioning grilles and light fixtures.
 - 3. System is not to support lateral loads from partitions.
 - 4. Fasteners must be capable of sustaining, without failure, hanger wires with 200 lbs. tension load and bracing wires with 440 lbs. tension load.

1.4 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data.
 - a. Manufacturers Product Information for each type of Acoustical Ceiling Tile or Panel scheduled to be used.
 - b. Manufacturers Product Information for each component of the Suspension System specified or scheduled.
 - 2. Shop Drawings.
 - a. Submit shop drawings from manufacturer detailing ceiling suspension system assemblies and indicating dimensions, method of field assembly (including hanger and bracing wires, compression struts, wall angle attachments), other components, and location and detail of each suspension system grid connection.

- 1) Submit drawings showing details of Hanger Wires, Brace Wires, expansion joint locations, and Compression Strut connections to structure and to suspension system.
3. Samples.
 - a. Provide 4-to-6-inch square sample for each type of Acoustical Ceiling Tile or Panel scheduled to be used.
 - b. Provide 12-inch lineal sample of Suspension System components for each type of system specified or scheduled.
4. Quality Assurance/Control Submittals:
 - a. Test Reports:
 - 1) Tension Tests of acoustical ceiling wire anchors provided by Testing Agency.
 - b. Certificates:
 - 1) General Construction: Certification signed by the Contractor on Contractor's letterhead.
 - 2) Certificates signed by manufacturers of Acoustical Ceiling components certifying that their products comply with specified requirements.
 - c. Manufacturer's Written Instructions:
 - 1) Manufacturer's written instructions showing their suspension grid installation methods.
5. Closeout Submittals in accordance with the following:
 - a. In accordance with Specification Section - PROJECT DOCUMENTS.
 - b. Warranty in accordance with Specification Section - WARRANTIES.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Material Qualifications:
 - a. Where fire-rated Acoustical Ceiling assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per UL or ASTM E 119 "Test Methods for Fire Tests of Building Construction and Materials," by an independent testing and inspecting agency acceptable to the California State Fire Marshal.
 - b. Source Limitations:
 - 1) Acoustical Ceiling Tiles or Panels: Obtain each type through one source from a single manufacturer.
 - 2) Suspension Systems: Obtain each type through one source from a single manufacturer.
2. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 - 1) Helpers and apprentices used for such work shall be under full and constant supervision at all times by thoroughly skilled Acoustical Ceiling and Suspension System installers.
 - 2) In the acceptance or rejection of installed Acoustical Ceiling or Suspension Systems, no allowance will be made for lack of skill on the part of the installers.
3. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.

- b. Products, materials and evaluation reports to comply with IR-A5.
 - B. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CBC California Building Code (CBC 803.1.1)
 - b. CDPH California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers"
 - c. CSFM California State Fire Marshal.
 - d. FDA Food and Drug Administration, a department of US Department of Health and Human Services.
 - e. IR Interpretation of Regulations.
 - f. USDA/FSIS United States Department of Agriculture., Food Safety and Inspection Service.
 - C. Certificates:
 - 1. General Construction: Contractor to certify that work provided meets or exceeds the requirements of this section.
 - 2. Products: Manufacturers of Acoustical Ceiling components shall certify that their products comply with specified requirements.
 - D. Meetings:
 - 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 - 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Packing, shipping, handling, and unloading:
 - 1. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.
 - B. Acceptance at Site:
 - 1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
 - 2. Damaged products will not be accepted.
 - C. Storage and protection:
 - 1. Products shall be stored in a fully enclosed, conditioned space and protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination and other causes.
- 1.7 PROJECT CONDITIONS
- A. Environmental requirements:
 - 1. Do not install acoustical ceilings until spaces are enclosed and weatherproof.
 - 2. Wet work and dry work in spaces is completed, dry and dust free.
 - 3. Work above ceilings is completed.

4. Ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - B. Existing Conditions:
 1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
- 1.8 SEQUENCING AND SCHEDULING
- A. Coordination:
 1. Coordinate layout and installation of Acoustical Ceiling Tiles, Panels and the Suspension Systems with other construction that penetrates ceilings or is supported, including light fixtures, HVAC equipment, smoke monitoring and fire-suppression systems.
- 1.9 WARRANTY
- A. Contractor's General Warranty:
 1. In accordance with Specification Section - WARRANTIES.
 - B. Manufacturer's Warranty:
 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.
 - C. Installer's Warranty:
 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period [One (1) Year.][Five (5) years.]

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
- A. Products specified are from companies listed below, or approved equivalent. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers listed as acceptable alternative manufacturers must still comply with the requirements of the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 1. Specified Tile and Panel product manufacturer:
 - a. ARMSTRONG WORLD INDUSTRIES.
 - b. Acceptable alternative manufacturers:
 - 1) CERTAINTEED.
 - 2) UNITED STATES GYPSUM COMPANY, USG INTERIORS.
 2. Specified Suspension System product manufacturer:
 - a. ARMSTRONG WORLD INDUSTRIES.
 - b. Acceptable alternative manufacturers:
 - 1) ROCKFON NORTH AMERICA - CHICAGO METALLIC CORPORATION.
 - B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.
- 2.2 MATERIALS
- A. Tile or Panel:
 1. General:
 - a. Standard: Provide manufacturer's standard tile or panels of configuration indicated that comply with ASTM E 1264 "Standard Classification for Acoustical Ceiling

Products" classifications as designed by type, pattern, acoustical rating, light reflectance, and fire-rating, unless otherwise indicated.

- b. Colors and Patterns: Match appearance characteristics indicated for each product type.
 - c. Antimicrobial Treated:
 - 1) Coating-Based: Provide tile or panel face surfaces (front and back) with coated antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 "Standard Test method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber."
 - 2) Panel-Base: Provide tiles or panels treated with manufacturers standard antimicrobial solution that inhibits fungus, mold, mildew, gram-positive and gram-negative bacteria.
 - 2. See the Acoustical Tile and Panel Schedule at the end of this section for specified tile or panel types.
- B. Suspension Systems:
- 1. General:
 - a. Classification of Suspension System Grid is Heavy Duty in accordance with ASTM C 635 "Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and lay-in Panel Ceilings," ASTM E 580 "Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint," Section 5.1, ASCE 7 as modified by CBC Sections 1617A.1.21, 2506.2.1, and DSA IR 25-2.
 - b. Provide Underwriter's Laboratory (UL) design number or California State Fire Marshal (CSFM) Listing number for the fire-rated ceiling assembly.
 - 1) The components and installation details must conform in every respect with the UL or CSFM approval for the design number specified.
 - 2) Custom designs which combine components from different approval designs but have not been tested as a complete assembly are not acceptable.
 - 3) See Exposed Grid at end of this section for specified system numbers.
 - 2. Wire:
 - a. Soft temper, Class 1 zinc coating, in accordance with ASTM A 641 "Specification for Zinc-Coated (Galvanized) Carbon Steel Wire."
 - 1) Hanger: 12 gage (0.106 inch diameter).
 - 2) Brace: 12 gage (0.106 inch diameter).
 - 3. Clip Attachments:
 - a. General: Fabricate from corrosion-resistant material with holes or loops for attaching hanger and brace wires.
 - 1) Ceiling Clips: 3/4" wide x 13 gage, galvanized steel.
 - 2) Steel Straps:
 - a) 1" wide x length as required, 12 gage galvanized steel.
 - b) 3" wide x 4" long x 12 gage galvanized steel.
 - 4. Grid:
 - a. Grid System shall be manufactured from commercial quality galvanized steel.
 - b. All Tee Grid System Numbers are from ARMSTRONG WORLD INDUSTRIES.
 - 1) Exposed Non-Rated 15/16" Tee Grid System "Prelude XL" (P-XL).
 - 2) Exposed Fire-Rated 15/16" Tee Grid System "Prelude XL Fire Guard" (P-XL).
 - 3) Exposed Non-Rated 9/16" Tee Grid System "Suprafine XL" (S-XL).
 - c. Main Runners:

- 1) Main Runner – Non-Rated 15/16" #P-XL 7301.
- 2) Main Runner – Fire-Rated 15/16" #P-XL 8301.
- 3) Main Runner - Non-Rated 9/16" #S-XL 7501.
- 4) Capped, Double-Web roll-formed from cold-rolled steel sheets, pre-painted with factory punched cross runner slots, hanger holes and integral bayonet style and couplings.
- 5) Fire-rated: Manufactured with fire-expansion reliefs.

d. Cross Runners:

- 1) 2' Non-Rated Cross Runner 15/16" #P-XL 7328.
- 2) 4' Non-Rated Cross Runner 15/16" #P-XL 7341.
- 3) 2' Fire-Rated Cross Runner 15/16" #P-XL 8323.
- 4) 4' Fire-Rated Cross Runner 15/16" #P-XL 8341.
- 5) 2' Non-Rated Cross Runner 9/16" #S-XL 7520.
- 6) 4' Non-Rated Cross Runner 9/16" #S-XL 7540.
- 7) Capped, Double-Web roll-formed from cold-rolled steel sheets, pre-painted with factory punched cross runner slots and hanger holes.
- 8) Fire-rated: Manufactured with fire-expansion reliefs.

e. Wall Angles:

- 1) "Angle" Ceiling Edge Trim, hemmed exposed edges, 7/8" x 7/8", #7800.
- 2) "Angle" Ceiling Edge Trim, hemmed exposed edges, 2" x 2", #7808.
- 3) Roll-formed of sheet metal of same gage and finish as the main runners.
- 4) Provide wall angles fabricated to diameter required to fit circular penetrations of ceilings exactly.

f. Panel Hold Down Clips:

- 1) Hold Down Clip #P-XL 414.

g. Compression Struts (Metal angles, galvanized steel):

- 1) 1/8 inch thick x 1 inch x 1 inch 800 lbs./1000 feet weight.
- 2) 3/16 inch thick x 1-1/4 inch x 1-1/4 inch 1,480 lbs./1000 feet weight.
- 3) 3/16 inch thick x 1-1/2 inch x 1-1/2 inch 1,800 lbs./1000 feet weight.
- 4) 3/16 inch thick x 1-3/4 inch x 1-3/4 inch 2,120 lbs./1000 feet weight.
- 5) 3/16 inch thick x 2 inch x 2 inch 2,440 lbs./1000 feet weight.
- 6) 3/16 inch thick x 2 inch x 2-1/2 inch 3,070 lbs./1000 feet weight.
- 7) 3/16 inch thick x 3 inch x 3 inch 3,710 lbs./1000 feet weight.
- 8) 1/4 inch thick x 3-1/2 inch x 3-1/2 inch 5,800 lbs./1000 feet weight.
- 9) 1/4 inch thick x 4 inch x 4 inch 6,600 lbs./1000 feet weight
- 10) Alternate Compression Struts Refer to drawings.

a) Must be submitted to and approved by DSA.

h. Seismic Clips:

- 1) Seismic Perimeter Clips #BERC2.

i. Cold Rolled Channels, 16 gage galvanized steel:

- 1) 1-1/2" x 17/32" flange 475 lbs/1000 feet weight.

2.3 ACCESSORIES

A. Fasteners:

1. Wood Construction:

- a. Provide corrosion-resistant materials.
- b. Eye screws, minimum 1/4 inch diameter, 1-1/4 inch minimum embedment.
- c. Staples, 1-1/2 inch x 0.148 inch diameter (9 gage).
- d. Nails, STRONGHOLD "J" nails.

2. Steel Framing:

- a. Shot-in Anchors.

3. Metal Deck or Metal Deck without Structural Concrete:

- a. Self-tapping Screws.
 - 4. Metal Deck or Metal Deck with Structural Concrete or Concrete:
 - a. Shot-in Anchors (hanger wire only).
 - b. Drilled-in Anchors.
 - 5. Suspension System Fasteners, runner to wall angle:
 - a. Pop rivets as standard with the manufacturer, heads to match the finish of the main runners.
 - 1) Pop-rivets, screws or other attachments are not acceptable unless specifically detailed on the manufacturer's drawings and approved by UL and the CSFM.
 - B. Adhesives:
 - 1. Provide adhesives that comply with all requirements of ASTM D 1779 "Standard Specification for Adhesive for Acoustical Materials," for non-rated and fire-rated assemblies, and shall be compatible with the substrate to which the tile is to be installed as well as the tile material selected, and shall be UL Labeled for Class 0 - 25 Flame Spread..
 - C. Sealants:
 - 1. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834 "Specification for Latex Sealants," and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90 "Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements."
 - 2. Acoustical Sealant for Concealed Joints: Manufacturer's standard non-drying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.
 - D. Other Materials: All other miscellaneous materials, not specifically described, but required for a complete and proper installation of acoustical ceilings, shall be as selected by the Contractor subject to the approval of the Architect.
- 2.4 FINISHES
- A. Factory Finish:
 - 1. Suspension System: Manufacturer's standard baked-on enamel finish to all members. All fasteners shall match the main runner finishes.
 - a. General: Comply with NAAMM's "Metal Finishes manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 2. Tile or Panel: Refer to Tile and Panel Schedule for finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 - 1. Prior to the execution of the work under this specification section, examine substrates, areas, and conditions, including structural framing to which acoustical ceilings attach or abut, with installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical ceilings.
 - 2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 - 3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Coordination:

1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
2. Coordinate proper placement of ceiling mounted tracks, accessories, light fixtures, HVAC registers and other items which are to be integrated with acoustical ceilings.
3. Measure each ceiling area and establish layout of acoustical tiles or panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles or panels at borders and comply with layout shown on reflected ceiling plans.

B. Protection:

1. Do not begin work until all rooms have been protected against the weather.
2. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.

C. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.

3.3 INSTALLATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations along with CISCA's "Ceiling Systems Handbook" and USDA.
2. In accordance with approved Submittals.
3. In accordance with Regulatory Requirements.
4. Installation shall comply with ASTM C 636 "Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels," and ASTM E 580 "Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint," Section 5.2.
5. Installation shall also comply with CBC Section 1617A.1.21, 2506.2.1, and DSA IR 25-2.

B. Layout:

1. Lines shall be straight and true.
2. Set plumb, level, and square.

C. Suspension System:

1. 12 gage (minimum) hanger wires may be used for up to and including 4'-0" x 4'-0" grid spacing and attached to main runners. Splices will not be permitted in any hanger wires unless specifically approved by DSA/SSS.
2. Provide 12 gage hanger wires at ends of all main and cross runners within 8" from the support or within 1/4 of the length of the end tee, whichever is least, for the perimeter of the ceiling area.
 - a. End connections for runners, which are designed and detailed to resist the applied horizontal forces may be used in lieu of the 12 gage hanger wires subject to DSA/SSS review and approval.
 - b. Perimeter wires are not required when the length of the end tee is 8" or less.
3. Provide trapeze or other supplementary support members at obstructions to maintain hanger spacing.
 - a. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or discontinuous areas.
 - b. Hanger wires that are more than 1 in 6 out of plumb are to have counter-sloping wires.
4. Ceiling grid members may be attached to not more than 2 adjacent walls. Ceiling grid members should be at least 3/4 inch free of other walls.
 - a. If walls run diagonally to ceiling grid system runners, one end of main and cross runners should be free and a minimum of 3/4 inch clear of wall.

- b. Pop rivets, screws, or other attachments in fire-rated ceilings shall not be acceptable unless specifically detailed on the manufacturer's drawings and approved by UL and DSA/FLS.
- 5. At the perimeter of the ceiling area where main or cross runners are not connected to the adjacent wall, provide Seismic Perimeter Clip, installed in accordance with manufacturer's instructions and ICC-ES Evaluation Report.
- 6. Provide bracing assemblies consisting of a compression strut and slotted angle spacer of four (4) 12 gage splayed bracing wires oriented 90 degrees from each other.
 - a. Bracing assemblies shall be provided for each 144 square feet of ceiling area.
 - 1) Spaced not more than 12 feet by 12 feet on center.
 - b. Bracing assemblies shall be located not more than 1/2 the above spacing from each perimeter wall or at the edge of vertical ceiling offsets.
 - c. The slope of these wires should not exceed 45 degrees from the plane of the ceiling and should be taut without causing the ceiling to lift.
 - d. Splices in bracing wires are not permitted unless specifically approved by DSA/SSS.
 - e. Fire-Rated Assemblies shall have a bracing assembly for each 96 square feet.
 - 1) The first bracing assembly is required not more than four feet (4'-0") from each wall.
 - 2) A minimum of one bracing assembly is required between any two adjacent expansion cut-outs on runners being braced.
 - f. Bracing assemblies are not required where the ceiling area is:
 - 1) 144 sq. ft. or less.
- 7. Fasten hanger wires with not less than 3 tight turns. Fasten bracing wires with 4 tight turns.
 - a. Make all tight turns within a distance of 1-1/2 inches.
 - b. Hanger or bracing wire anchors to the structure should be installed in such a manner that the direction of the wire 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, conduit, etc.
 - a. It is acceptable to attach lightweight items, such as single electrical conduit not exceeding 3/4" nominal diameter, to hanger wires using connectors acceptable to DSA/SSS.
- 9. Attach all light fixtures and ceiling mounted air terminals or services to the ceiling grid runners to resist a horizontal force equal to the weight of the fixtures.
 - a. Approved screws or fasteners are required.
- 10. Flush or recessed light fixtures weighing less than 56 pounds and mechanical terminals and services weighing less than 20 lbs. may be supported directly on the runners of a heavy-duty grid system but, in addition, they must have a minimum of two (2) 12 gage slack safety wires attached to the fixture at diagonal corners and anchored to the structure above.
 - a. All 4 ft. x 4 ft. fixtures must have slack safety wires at each corner.
- 11. All flush or recessed light fixtures weighing 56 pounds or more and mechanical terminals and services weighing 20 lbs. or more shall be independently supported by not less than four (4) taut #12 gage wires each attached to the fixture.
 - a. Wires and their attachment to the structure must be capable of supporting 4 times the weight of the unit and attached to the structure above regardless of the type of ceiling grid system used.
- 12. Support surface mounted light fixtures by at least two positive devices which surround the runner and which are each supported from the structure above with 12 gage wire.
 - a. Spring clips or clamps that connect only the runner are not acceptable.

- b. Provide additional supports when light fixtures are 8'-0" or longer.
 - 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 four (4) times the weight of the fixture.
 - a. Bracing assembly is required where the pendant hanger penetrates the ceiling.
 - b. Pendant hanger is required to attach to the bracing assembly to transmit horizontal forces.
 - c. Maximum spacing between supports shall not exceed 8 feet.
 - 14. Ceiling Edge Condition:
 - a. Where Grid System abuts wall, fasten wall angles to framing in wall structure.
 - 1) At Wood Framing, attach to backing with No. 10 x 3" Screws at 16" o.c.
 - 2) At Metal Framing, attach to metal framing backing with No. 8 self-tapping sheet metal screws at 16" o.c.
 - b. Where Grid System terminates free from wall, fasten wall angles to Grid system with Fasteners. No screw or rivets shall appear on any exposed surface.
 - 15. Supplemental Support Members:
 - a. Where the width of ducts or other obstructions interfere with typical hangers and bracing assemblies, provide and install supplemental members and hangers in the form of trapeze or equivalent devices.
 - b. Provide additional hangers, struts, or braces at all ceiling breaks, soffits, or discontinuous areas.
 - c. Hanger wires that are more than one (1) horizontal in six (6) vertical shall have counter-sloping wires.
 - 16. Expansion Joints:
 - a. Expansion Joints shall be provided and installed in the ceiling at intersections of corridors and junctions of corridors with lobbies or other similar areas.
 - 17. Expansion Joints shall be provided and installed in ceiling areas exceeding 2,500 sq. ft. in order to separate ceilings into areas not exceeding 2,500 sq. ft.
 - D. Suspended Acoustical Ceiling Panels:
 - 1. Install acoustical ceiling panels with undamaged edges and fit accurately into suspension system runners and wall angles. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - a. Install panels with pattern running in one direction.
 - 2. Paint cut edges of panels remaining exposed after installation.
 - a. Match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical ceiling manufacturer.
 - 3. Install hold down clips at all Fire-Rated acoustical ceiling assemblies, food preparation areas, and at locker/shower areas.
 - 4. Penetrations through the ceiling for sprinkler heads and other similar devices that are not integrally tied to the ceiling system in the lateral direction shall have a two (2) inch oversized ring, sleeve, or adapter through the ceiling tile to allow free movement of one (1) inch in all horizontal directions. Alternatively, swing joints may be provided per ASTM E 580, Section 5.2.8.5.
 - E. Adhesively applied Acoustical Tiles:
 - 1. Installation shall comply to ASTM D 1779 "Standard Specification for Adhesive for Acoustical Materials."
- 3.4 FIELD QUALITY CONTROL
- A. Site Tests:
 - 1. Testing Agency: The Owner's Testing Laboratory Agency shall perform field tests and Inspections and prepare test reports.

- a. Testing and inspecting of completed installations of acoustical ceiling fasteners and anchors shall take place in successive stages, in areas of extent and using methods as follows.
- b. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
- 2. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed:
 - a. Concrete Anchors:
 - 1) Must be capable of sustaining, without failure, a load equal to 200 lbs. tension for hanger wires and 440 lbs. tension for bracing wires by construction as determined by testing according to ASTM E 488 "Test methods for Strength of Anchors in Concrete and Masonry Elements," by a qualified independent testing agency.
 - a) Hanger Wire Anchors 1 in 10 must be field tested.
 - b) Bracing Wire Anchors 1 in 2 must be field tested.
- 3. Remove and replace acoustical panel ceiling hangers where test results indicate that they do not comply with specified requirements.
- 4. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 - a. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

B. Inspection:

- 1. As required by Regulatory Requirements.
- 2. Schedule inspections and notify the Architect, Project Inspector and any other regulatory agencies of the time at least 48 hours prior to the inspection.
- 3. No work shall be without the inspections required by Regulatory Requirements.

3.5 CLEANING

A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.

- 1. Clean any soiled surfaces immediately.
- 2. Clean any soiled surfaces at the end of each day, minimum.
- 3. Finish shall be clean and ready for the application of any additional finishes.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturers written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.6 SCHEDULES

A. Tile and Panel Schedule:

- 1. TYPE ACT-I:
 - a. Design "Fissured Medium Texture" No. 755, Minaboard Panel.
 - b. Manufacturer ARMSTRONG WORLD INDUSTRIES.
 - c. Material:
 - 1) Wet-Formed mineral fiber, with factory-applied vinyl latex paint surface finish.
 - d. Size 24" x 48" x 5/8" panel – "Square Cut" lay-in edge.
 - e. Mounting 15/16" Non-Rated exposed tee grid.
 - f. NRC Rating 0.55.
 - g. CAC 30.
 - h. Light Reflectance per ASTM E 1477 "Test method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers":

- 1) 0.81.
- i. ASTM Classification per ASTM E 1264 "Classification for Acoustical Ceiling Products":
 - 1) Type III, Form 2, Pattern C D.
- j. Class A per ASTM E 84 "Test method for Surface burning Characteristics of Building Materials":
 - 1) Flame Spread Index 25 or under.
 - 2) Smoke Density Developed Index 50 or less.
- k. Color "White."
- l. Antimicrobial Treatment None.

1. TYPE ACT-IX:

B. Manufacturer: ARMSTRONG WORLD INDUSTRIES.

- 2. Design: "Kitchen Zone" No. 672.
- 3. Material: Wet-formed mineral fiber.
- 4. Size: 24" x 48" x 5/8" panel
- 5. Mounting: 15/16" exposed tee grid. . (Main grid at 48" o.c. with Cross Tees at 24" o.c).
- 6. NRC Rating: N/A.
- 7. CAC Rating: 33.
- 8. Light Reflectance per ASTM E 1477 "Test method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers": 0.89.
- 9. Class A per ASTM E 84 "Test method for Surface burning Characteristics of Building Materials".
 - 1) Flame Spread Index 25 or under.
 - 2) Smoke Density Developed Index 50 or less.
- 11. Finish: Factory-applied latex paint.
- 12. Color: White.

SECTION 09 65 10 – RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all Resilient Base and Accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 30 00 CAST-IN-PLACE CONCRETE
 - 4. 06 10 00 ROUGH CARPENTRY
 - 5. 06 41 23 MODULAR CASEWORK
 - 6. 09 29 00 GYPSUM BOARD
 - 7. 09 68 40 CARPET
 - 8. 09 91 00 PAINTING
 - 9. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 10. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with Specification Section - Regulatory Requirements, and the following standards:
 - a. ADAAG Americans with Disabilities Act Accessibilities Guidelines.
 - b. RFCI The Resilient Floor Covering Institute.

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data:
 - a. For each type of resilient base and accessory indicated.
 - b. Manufacturer's full color range (including any standard and premium colors).
 - c. Design Data for all compounds, fillers, adhesives, etc.
 - 2. Samples.
 - a. Provide 6-inch linear samples of each piece of trim material specified.
 - 3. Quality Assurance/Control Submittals:
 - a. Manufacturer's Written Installation Instructions.
 - b. Certificate from resilient base installer that all products supplied for installation comply with local regulations in the area where the project is located controlling the use of Volatile Organic Compounds (VOC's).
 - c. Statement of Installer's Qualifications.
 - 4. Closeout Submittals in accordance with Specification Sections in Division One:
 - a. Maintenance Data (including recommended polish and buffing procedures) in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Record Documents in accordance with Specification Section – PROJECT DOCUMENTS.
 - c. Warranty in accordance with this Specification Section, and Specification Section – WARRANTIES.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications:

- a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project, and is competent in the techniques required by the manufacturer.

2. Manufacturer/Supplier Qualifications:

- a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.

B. Regulatory Requirements:

1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:

- a. CBC California Building Code (CBC 11B-302.1)

C. Meetings:

1. Pre-Installation: Scheduled by the Contractor prior to the start of work.

- a. Coordinate the work with other work being performed.
- b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
- c. Review delivery, storage, and handling procedures.
- d. Review Project Conditions.
- e. Review subfloor preparation procedures.

2. Progress: Scheduled by the Contractor during the performance of the work.

- a. Review for proper installation of work progress.
- b. Identify any installation problems and acceptable corrective measures.
- c. Identify any measures to maintain or regain project schedule if necessary.

3. Completion: Scheduled by the Contractor upon proper completion of the work.

- a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
- b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, shipping, handling, and unloading:

- 1. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.

B. Acceptance at Site:

- 1. Products must be in manufacturer's original unopened containers with labels indicating brand name, type, color, and size.
- 2. Damaged products will not be accepted.

C. Storage and protection:

1. Products shall be stored in a dry, protected, interior area above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.

- a. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.
- b. Maintain temperature in the storage space between fifty (50) degrees Fahrenheit and ninety (90) degrees Fahrenheit.
 - 1) Seven (7) days prior to installation, acclimate products to environmental requirements of the article titled PROJECT CONDITIONS of this specification section, and the Paragraph titled "Environmental Requirements."

1.6 PROJECT CONDITIONS

- A. Environmental requirements:
 - 1. Temperature: Maintain temperature in space to receive products at sixty-eight (68) degrees Fahrenheit for two (2) days prior, during, and two (2) days following installation.
 - a. After this period, maintain a temperature of not less than fifty-five (55) degrees Fahrenheit.
 - b. After installation, at no such time shall the temperature exceed eighty-five (85) degrees Fahrenheit.
- B. Existing Conditions:
 - 1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 - 2. Field Measurements:
 - a. Take and be responsible for field measurements as required.
 - b. Report any significant differences between field dimensions and drawings to the Architect.

1.7 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty:
 - a. Rubber Base Two (2) Years.
 - b. Vinyl Base Two (2) Years.
 - c. Rubber Stair Tread, Risers, and Stringers Ten (10) Years.
 - d. Transitions Two (2) years.
- C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty Period Two (2) Years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 - 1. Rubber Base manufacturer:
 - a. MANNINGTON COMMERCIAL
 - b. Acceptable alternative manufacturers:
 - 1) ROPPE CORPORATION.
 - 2. Vinyl Base manufacturer:
 - a. MANNINGTON COMMERCIAL.
 - b. Acceptable alternative manufacturers:
 - 1) ROPPE CORPORATION.
 - 3. Rubber Stair Tread, Riser, and Stringer manufacturer:
 - a. MANNINGTON COMMERCIAL.

- b. Acceptable alternative manufacturers:
 - 1) ROPPE CORPORATION.
- 4. Transitions manufacturer:
 - a. MANNINGTON COMMERCIAL.
 - b. Acceptable alternative manufacturers:
 - 1) ROPPE CORPORATION.
- 5. Underlayment Compound manufacturer:
 - a. ARDEX INCORPORATED.
 - b. Acceptable alternative manufacturers:
 - 1) CHEMREX.
 - a) A compatible bonding agent is needed for this product to adhere to the Vapor-Alkalinity Control System and be considered as equivalent.
- 6. Crack and Joint Filler manufacturer:
 - a. ARDEX INCORPORATED.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. General:
 - 1. Resilient base and accessories shall be of first quality and the product of one manufacturer.
 - 2. Stair Treads shall be slip resistant by achieving a minimum 0.6 or greater static coefficient of friction as recommended in Appendix A4.5 of the ADAAG by testing per ASTM D 2047 "Test method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine."
 - 3. Colors and patterns shall be selected from manufacturer's standard line (including premium) except as noted otherwise.
 - a. Stair treads, risers, and stringers shall be of the same color or matching color and product line.
 - 4. All resilient base and accessories shall be impervious to water damage.
 - 5. Minimize seams.
- B. Rubber Base:
 - 1. Shall comply with ASTM F 1861 "Standard Specification for Resilient Wall Base," for Type TS (Vulcanized Rubber), Group 1 (Solid and Homogeneous).
 - a. Critical Radiant Flux shall be Class 1, not less than 0.45 W/sq.cm. per ASTM E 648 "Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source."
 - 2. Base shall be [Coved] [Straight] [Butt-to] [Sculptured].
 - 3. Thickness: 0.125".
 - 4. Base height shall be [4"] [6"].
 - 5. Length: as long as possible to reduce seams.
 - 6. Provide factory molded inside and outside base corners from the same dye lot as the rubber base.
- C. Vinyl Base:
 - 1. Shall comply with ASTM F 1861 "Standard Specification for Resilient Wall Base," for Type TV (Vinyl Thermoplastic), Group 1 (Solid and Homogeneous).
 - a. Critical Radiant Flux shall be Class 1, not less than 0.45 W/sq.cm. per ASTM E 648 "Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source."
 - 2. Base shall be [Coved] [Straight] [Butt-to] [Sculptured].
 - 3. Thickness shall be 0.125".
 - 4. Base height shall be [4"] [6"].

5. Length: 100' coils.
6. Provide pre-formed inside and outside base corners from the same dye lot as the vinyl base.
- D. Rubber Stair Tread, Riser, and Stringer (or Skirting):
 1. Stair Tread shall comply with ASTM F 2169 "Standard Specification for Resilient Stair Treads," Type TS (Vulcanized Rubber), Class 1 (Smooth) and 2 (Patterned), Group 1 (Abrasive Nosing) and 2 (Visually Impaired Nosing).
 - a. Critical Radiant Flux shall be Class 1, not less than 0.45 W/sq.cm. per ASTM E 648 "Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source."
 - b. Shall meet Shore A of not less than 85 per ASTM D 2240 "Standard Test method for Rubber Property – Durometer Hardness."
 - c. Thickness shall be 0.125".
 - d. Provide square nose.
 2. Stair Riser and Stringer shall comply with ASTM F 1861 "Standard Specification for Resilient Wall Base," Type TS (Vulcanized Rubber), Group 1 (Solid and Homogeneous).
 - a. Critical Radiant Flux shall be Class 1, not less than 0.45 W/sq.cm. per ASTM E 648 "Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source."
 - b. Thickness shall be 0.125".
 - c. Riser and Stringer shall be [**Coved**] [**Straight**].
- E. Transitions:
 1. Include molding caps, dividers, edges, cove supports, feature strips, reducers, stair nosings, etc.
 2. Shall be composed of Thermoplastic Vinyl throughout item.
 - a. Stair Nosings shall be Thermoplastic Rubber (Vulcanized Rubber).
 3. Critical Radiant Flux shall be Class 1, not less than 0.45 W/sq.cm. per ASTM E 648 "Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source."
 4. Shall comply to dimension requirements of section 4.5.2 (changes in level) and section 4.5.3 (carpet-edge trim) of the ADAAG.
 5. Stair nosings shall provide color contrasting integral insert for the visually impaired as indicated.

2.3 ACCESSORIES

- A. Underlayment Compound:
 1. Provide free-flowing, self-leveling, pumpable, cement based compound (ARDEX K-15) for applications from 1 inch thick to feathered edges, 4000 psi minimum in accordance with ASTM C 109-modified for air cure only "Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)."
 - a. ARDEX "K-15."
- B. Crack and Joint Filler:
 1. Provide low viscosity rigid polyurethane filler, tensile strength of 4,000 psi minimum, in accordance with ASTM D 638 "Test method for Tensile Properties of Plastics."
 - a. ARDEX "ARDIFIX".
- C. Concrete Primer (if applicable):
 1. Nonstaining type as recommended in writing by flooring manufacturer.
- D. Adhesives:
 1. Adhesive as recommended in writing by resilient base manufacturer.
 - a. Provide manufacturer's written recommended epoxy adhesive at all rubber stair accessories and rubber stair nosings.
 2. Compatible with Vapor-Alkalinity Control System, if installed.
 3. Shall comply with requirements in the place where the project is located.

4. Shall be water and mildew resistant.
5. Shall bond to non-porous substrate surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of conditions:

1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual that affect the execution of work under this specification section.
2. Insure that all flooring has been installed, fitted close to the wall to provide even support to the resilient base, and to insure a tight, smooth fit along the floor.
3. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
4. Execution of work under this specification section shall constitute acceptance of existing conditions.

B. Concrete Subfloors:

1. Verify that concrete slabs comply with ASTM F 710 "Practice for Preparing Concrete Floors to Receive Resilient Flooring."
2. Verify that substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.
3. Verify that subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
4. Evaluate the RH (Relative Humidity) and pH (Alkalinity) for compliance with adhesives and resilient tile manufacturer's written substrate preparation recommendations.
 - a. If a Vapor-Alkalinity Control System product has been installed to reduce water vapor emission or phosphates thereby negating the RH and pH Test Results, evaluate products for compatibility with adhesives and resilient base products.
5. Determine adhesion characteristics by performing bond tests recommended by the resilient base and accessory manufacturer.

C. Wood Subfloors:

1. Verify underlayment over subfloor complies with Specification Section - ROUGH CARPENTRY.
2. Verify underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through the surface.

3.2 PREPARATION

A. Coordination:

1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.

B. Protection:

1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work.

C. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Wall substrates to receive resilient base must be completely clean, dry, smooth and free of oil, grease, rust, paint, varnish, shellac, or any other foreign substance.
3. From floor substrates, remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that may contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the resilient base and accessory manufacturer.
 - a. If a Vapor-Alkalinity Control System has been installed, do not remove this system.

4. Fill all cracks, joints, etc. with a Crack and Joint Filler according to manufacturer's written instructions.
5. Install self-leveling underlayment compound at depressed or uneven floor conditions.
6. Vacuum clean substrates to be covered immediately before installation.
7. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
8. Proceed only after unsatisfactory conditions have been corrected.
9. Perform manufacturer recommended bond test to verify adhesion of resilient base and accessory to substrate.
10. Apply any recommended primers over the leveling compounds or treated concrete slabs prior to the installation of any resilient base or accessory products if recommended by the manufacturer.

3.3 INSTALLATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
2. In accordance with approved submittals.
3. In accordance with Regulatory Requirements.
4. Set plumb, level, and square.

B. Layout:

1. Lines shall be straight and true.
2. Refer to Floor Pattern Drawing(s) in the Interior Color Schedule for transitions in color.

C. Resilient Base installation:

1. For base installations on primed metal or enameled surfaces, provide manufacturer's written recommended co-adhesive method of installation applied to both surfaces with contact bond adhesive.
2. On dry, absorbent surfaces, the base shall be adhered with manufacturer's written recommended adhesive and firmly pressed to the walls.
3. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
4. Install in lengths as long as possible to minimize seams.
5. Minimize gaps at seams.
6. Align tops of adjacent pieces.
7. Tightly adhere resilient base to substrate throughout length of piece, with base in continuous contact with horizontal and vertical substrates.
8. Do not stretch resilient base during installation.
9. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
10. Pre-molded Corners: Install pre-molded corners before installing straight pieces.
11. After the installation, remove all excess adhesive before it dries.
12. Allow adhesive to set firm for approximately 24 hours before washing or applying any pressure.

D. Stair Tread, Riser, and Stringer installation:

1. Each step, riser, and stringer shall be measured, scribed and trimmed to fit and dry laid on each step prior to installing.
2. Provide visually impaired stripping at nosing to each tread as indicated.
3. Stringers shall be measured, trimmed and installed prior to tread and riser.
 - a. Adhere stringer in adhesive with the use of hand rollers.
4. Roll tread and riser immediately after application. Make sure each tread is tight to the nose and adhered to the nose.
5. After installation, immediately remove all excess adhesive before it dries.

E. Transition installation:

1. Measure and trim to fit transition pieces prior to installing.
2. Use appropriate approved manufacturer written adhesives for each substrate.

3. After installation, immediately remove all excess adhesive before it dries.

3.4 CLEANING

A. Cleaning:

1. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
2. Clean any soiled surfaces immediately.
3. Clean any soiled surfaces at the end of each day, minimum.
4. Finish shall be clean and ready for the application of any additional finishes.
5. In accordance with manufacturer's written instructions and recommendations.

3.5 PROTECTION

A. Protection from traffic:

1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.

END OF SECTION

SECTION 096723 – RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 30 00 CAST-IN-PLACE CONCRETE
 - 4. 05 12 00 STEEL AND FABRICATIONS
 - 5. 08 70 00 HARDWARE
 - 6. 09 29 00 GYPSUM BOARD
 - 7. 09 91 00 PAINTING
 - 8. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. ISO International Organization for Standardization

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data.
 - a. Submit technical data, installation instructions, and general recommendations for each resinous flooring material required.
 - b. Submit manufacturer's full color range (including any standard, premium and custom colors) for selection by the Architect.
 - 1) For initial selection of colors and finishes for consideration, submit manufacturer's color charts showing full range of colors and finishes available.
 - 2. Samples.
 - a. Provide 4 inch square sample of each type applied to a rigid backing, in color, finish, and texture as selected.
 - 3. Quality Assurance/Control Submittals:
 - a. Manufacturer / Supplier Qualifications.
 - b. Installer Qualifications and Certifications.
 - c. Certificates:
 - 1) Submit three (3) copies of certificates.
 - 2) Include ISO 9002 certification indicating that all materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested as a registered quality system.

- d. Manufacturer's written Instructions:
 - 1) Submit three (3) copies of manufacturer's written instructions.
- 4. Closeout Submittals in accordance with the following:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Warranty in accordance with Specification Section - WARRANTIES.

1.4 QUALITY ASSURANCE

A. Qualifications:

- 1. Manufacturer/Supplier Qualifications:
 - a. Single Source Responsibility: Obtain primary resinous flooring materials including vapor barrier, primers, resins, hardening agents, finish or sealing coats from a single source manufacturer with not less than ten (10) years of successful experience in manufacturing and installing principal materials described within this section.
 - b. Provide secondary materials only of type and from source recommended in writing by manufacturer of primary materials.
 - c. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.
- 2. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 - b. Engage an experienced Installer who is certified in writing by the manufacturer listed herein as qualified to install manufacturer's product (or system) in accordance with manufacturer's warranty requirements.

B. Regulatory Requirements:

- 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CBC California Building Code (CBC 11B-302.1).

C. Meetings:

- 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
- 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
- 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, shipping, handling, and unloading:

- 1. Products shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on-site weighing or volumetric measurements will be allowed.
- 2. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.

- B. Acceptance at Site:
 - 1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
 - 2. Damaged products will not be accepted.
- C. Storage and protection:
 - 1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.
 - a. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.
 - 2. Temperature of storage area shall be maintained between 60 and 85 degrees F.

1.6 PROJECT CONDITIONS

- A. Environmental requirements:
 - 1. Temperature: Maintain ambient temperature in space to receive products between sixty (60) degrees Fahrenheit and eighty-five (85) degrees Fahrenheit for seven (7) days prior, during, and seven (7) days minimum following installation. Inform the Owner of ambient temperature requirements for products installed and maintain until Substantial Completion and turn-over of the building or facility to the Owner.
- B. Existing Conditions:
 - 1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 - 2. Concrete substrate shall be properly cured for a minimum of 30 days.
 - 3. RH (Relative Humidity) and Alkalinity Test:
 - a. Shall control vapor transmission up to and including 100 percent readings per RH Testing of ASTM F 2170 "Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes."
 - b. Shall control alkalinity for a long term maximum resistance of pH 14 per pH Testing of ASTM F 710 "Preparing Concrete Floors to Receive Resilient Flooring."
 - 4. Job area to be free of other trades during floor installation.

1.7 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period **One (1) Year.**
- C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period **One (1) Year.**

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
1. Specified Membrane (Moisture Control System) product manufacturers:
 - a. STONHARD, INC. "MVT."
 - b. Acceptable alternative manufacturers:
 - 1) SHERWIN WILLIAMS HIGH PERFORMANCE FLOORING "RESUFLO Aqua MCS."
 2. Specified Epoxy Resinous Flooring product manufacturers:
 - a. STONHARD, INC. "STONSHIELD HRI."
 - b. Acceptable alternative manufacturers:
 - 1) SHERWIN WILLIAMS HIGH PERFORMANCE FLOORING "RESUFLO SCREED DECO QUARTZ."
 3. Specified Urethane Resinous Flooring product manufacturers:
 - a. STONHARD, INC. "STONSHIELD URI."
 - b. Acceptable alternative manufacturers:
 - 1) SHERWIN WILLIAMS HIGH PERFORMANCE FLOORING "FASTOP TOPFLOOR-U1."
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Membrane (Moisture Control System):
1. Two-component, high-solids, epoxy system designed to suppress excess moisture in concrete prior to an overlayment.
 2. Physical Properties:

a. Thickness:	15-16 mils.
b. Tensile Strength (ASTM D 638)	4,400 psi.
c. Percent Elongation (ASTM D 638)	12%.
- B. Epoxy Resinous Flooring: **RF-1:**
1. System Components:
 - a. Epoxy Primer.
 - b. Epoxy Mortar Base.
 - c. Epoxy Undercoat.
 - d. Quartz aggregate broadcast media.
 - e. Epoxy Sealer.
 2. Overall thickness: approximately 3/16".
 3. Physical Properties: Provide flooring system in which physical properties of topping including aggregate, when tested in accordance with standards or procedures referenced below, are as follows:

a. Compressive Strength (after 7 days):	10,000 psi.
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- 1) Per ASTM C 579 "Test methods for Compressive Strength of Chemical Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes."
- b. Tensile Strength: 2,000 psi.
 - 1) Per ASTM C 307 "Test Method for Tensile Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing."
- c. Flexural Strength: 4,300 psi.
 - 1) Per ASTM C 580 "Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes."
- d. Flexural Modulus of Elasticity: 2.0×10^6 psi.
 - 1) Per ASTM C 580 "Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes."
- e. Hardness (Shore D Durometer): 85-90.
 - 1) Per ASTM D 2240 "Standard Test Method for Rubber Property – Durometer Hardness."
- f. Bond Strength (100 percent concrete failure): 400 psi.
 - 1) Per ASTM D 4541 "Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers."
- g. Impact Resistant: 160 in.lbs.
 - 1) Per ASTM D 4226 "Test Methods for Impact Resistant of Rigid Poly Vinyl Chloride (PVC) Building Products."
- h. Abrasion Resistance (CS-17 wheel): 0.06 gm max weight loss.
 - 1) Per ASTM D 4060 "Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser."
- i. Flammability (extent of burning 0.25 inches max): Class I.
 - 1) Per ASTM D 635 "Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position."
- j. Thermal Coefficient of Linear Expansion: 1.3×10^{-5} in/in°C.
 - 1) Per ASTM C 531 "Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes."
- k. Water Absorption: 0.1 percent.
 - 1) Per ASTM C 413 "Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes."
- l. Heat Resistant Limitation:
 - 1) For continuous exposure: 140 deg. F.
 - 2) For intermittent spills: 200 deg. F.
- m. Cure Rate Allowance (at 77 deg. F, 24 hours for normal operations): 12 hours for foot traffic.
- n. VOC Content: Not to exceed 40 grams per liter.

2.3 ACCESSORIES

A. Joint Sealant Materials:

1. Manufacturer's compatible joint sealant materials in compliance with standards specified within Specification Section – SEALANTS.
 - a. STONHARD, INC. STONFLEX MP7.
 - b. Acceptable alternative manufacturers:
 - 1) SHERWIN WILLIAMS HIGH PERFORMANCE FLOORING: As recommended in writing by manufacturer, compatible with floor product.

B. Metal Trim:

1. Manufacturer's standard metal trim (cove strip), for terminating cove base.
2. Acceptable alternative manufacturers:
 - a. General Polymers: As recommended in writing by manufacturer, compatible with floor product.

2.4 FINISHES

- A. Color as selected by the Architect from manufacturer's standard colors.
- B. Surface Texture:
 1. General:
 - a. Application Method: Texture is broadcast into first application of Finish Coat by means of Spraycaster to refusal.
 - b. Number of Applications: One.
 - c. Provide smooth finish at areas under equipment.
 - d. Coefficient of Friction per ASTM D 2047 "Test method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine":
 - 1) Standard Texture: 0.8.
 - 2) Medium Texture: 0.7.
- C. Textures: Provide appropriate texture as recommended in writing by the manufacturer.
 1. T-2: Texture that is appropriate for Kitchen applications. Provide smooth finish at areas under kitchen equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual which, affect the execution of work under this specification section.
 2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Coordination:
 1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
- B. Protection:
 1. Protect all adjacent surfaces from drips, spray, air pollution of the surrounding environment, and other damage from work under this specification section.
- C. Surface preparation:
 1. Prepare surface in accordance with manufacturer's written instructions and recommendations.

2. Concrete subfloor shall be dry in accordance with RH and Alkalinity tests, as tested in accordance with Specification Section – VAPOR-ALKALINITY CONTROL.
3. Chipping around existing floor drains & floor sinks shall be in accordance with coating manufacturer's written recommendations for proper interface of resinous flooring so there is no standing water around drains after the resinous flooring system is applied.
4. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.
5. Comply with requirements in SSPC-SP 13/NACE No. 6, with a Concrete Surface Profile of 3 or greater in accordance with ICRI Technical Guideline No. 310.2R, unless manufacturer's written instructions are more stringent.
6. Control Joints:
 - a. After floor is blasted/prepared, pre-fill the joints with STONSET PM5 (or SHERWIN WILLIAMS HIGH PERFORMANCE FLOORING equivalent) epoxy patching mortar.
7. Expansion Joints:
 - a. Mark expansion joint widths on walls where proposed base would cover the marks so that one can find them again after the floor is applied.

3.3 APPLICATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
2. In accordance with approved submittals.
3. In accordance with Regulatory Requirements.
4. Set plumb, level, and square.

B. Layout:

1. Lines shall be straight and true.

C. Application:

1. Apply osmotic resistant grout to all slabs.
 - a. Troweled Mortar: Mix mortar material according to manufacturer's written recommended procedures.
 - 1) Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates.
 - a) Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resinous flooring materials and substrate
 - 2) Apply immediately after mixing.
 - 3) Pour a bead of material and rake out with a 1/2" x 1/2" V-notched rake.
 - 4) Apply the material at a thickness of 1/8".
 - 5) Roll the material with a spiked roller to release any entrained air and produce a smooth finish layer.
 - 6) Keep a wet edge so that each subsequent mix may be knit into the previous mix within a 20 minute period.
 - 7) Allow to cure for 24 hours in accordance with manufacturer's written recommendations.
 - 8) Prepare the membrane surface after curing by shot blasting to ensure proper adhesion. Edges and confined spaces must be ground with a diamond cup-stone. Once prepared, treat the membrane like a concrete surface.
2. Apply cove base and terminate to cove strip at +5" above finished floor for both coating types.

D. Epoxy Resinous Flooring application:

1. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates.
 - a. Coordinate timing of primer application with application of Resinous Flooring to ensure optimum adhesion between resinous flooring materials and substrate.
2. Mix Epoxy Resinous Flooring and then screed apply and trowel to a tightly closed finish.
3. Allow for at least an 8 hour cure.
4. Lightly grind the mortar base.
5. Mix and apply the undercoat to the floor surface using a steel squeegee, followed by rolling with a looped roller.
6. Immediately broadcast aggregate using manufacturer's written recommended equipment and techniques into the freshly applied undercoat.
7. Allow at least 8 hours (or longer depending on manufacturers recommendations) to cure between coats.
8. Scrape and sweep the floor to remove all loose aggregate particles, then vacuum.
9. Mix and apply sealer with strict adherence to manufacturer's installation procedures, and the texture type selected by the Architect.
10. Allow the sealer to cure in accordance with the manufacturer's written recommendations.

E. Expansion Joints:

1. Once the floor has been applied and has cured, find the Expansion Joint marks on the wall and saw cut to the width of the joint and fill with STONFLEX PM7 (or SHERWIN WILLIAMS HIGH PERFORMANCE FLOORING equivalent).

3.4 FIELD QUALITY CONTROL

A. Site Tests:

1. As required by Regulatory Requirements.
2. RH and Alkalinity Tests – see Specification Section – VAPOR-ALKALINITY CONTROL.
3. The right is reserved to invoke the following material testing procedure at any time, and any number of times during the period of flooring installation:
 - a. The Owner will engage the service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in the presence of the Contractor.
 - 1) Testing laboratory will perform tests for any of the characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.
 - 2) If test results show materials being used do not comply with specified requirements, the Contractor may be directed by the Owner to stop work; remove non-complying materials; pay for re-testing; re-apply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials until the work is right.
4. Floor Thickness Verification:
 - a. At the owner's discretion and under his supervision, the contractor shall take plus or minus 1" random cores per 1,000 sq. ft. through the system into the substrate to verify proper system thickness. Cored areas less than specified thickness shall be removed and replaced or increased in thickness by the installing contractor, in a manner that does not affect the performance or integrity of the system. Cored areas which comply with the written recommended system thickness shall be built up to match the surrounding surface elevation prior to applying the seal coat(s). Cores taken and patched will be noticeable, therefore, cores should be taken from areas where aesthetics are less critical

- B. Inspection:
1. As required by Regulatory Requirements.
 2. Schedule inspections and notify the Architect, Project Inspector and any other regulatory agencies of the time at least 48 hours prior to the inspection.
 3. No work shall be without the inspections required by Regulatory Requirements.

3.5 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
1. Clean any soiled surfaces immediately using cleaning materials and procedures recommended in writing by resinous flooring manufacturer.
 2. DO NOT clean the epoxy floors for a period of seven (7) days after installation in order to allow proper curing of the epoxy floor systems for full resistance to chemicals.

3.6 PROTECTION

- A. Protection from traffic:
1. Job area to be free of other trades for a period of twenty-four (24) hours after floor installation.
 2. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's written recommendations for protective materials and method of application.
 3. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.

END OF SECTION

SECTION 09 68 40 - CARPET

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all carpet materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 30 00 CAST-IN-PLACE CONCRETE
 - 4. 06 10 00 ROUGH CARPENTRY
 - 5. 06 41 23 MODULAR CASEWORK
 - 6. 09 22 16 METAL FRAMING
 - 7. 09 29 00 GYPSUM BOARD
 - 8. 09 30 00 TILE
 - 9. 09 65 10 RESILIENT BASE AND ACCESSORIES
 - 10. 09 91 00 PAINTING
 - 11. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. AATCC American Association of Textile Colorists and Chemists.
 - b. ASTM American Society of Testing Materials.
 - c. CRI Carpet and Rug Institute Recommendations and Standards.

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data.
 - a. For each type of carpet indicated:
 - b. Manufacturer's full color range (including any standard and premium colors).
 - c. Design data for all adhesives, tape, etc. for all carpet accessories.
 - 2. Shop Drawings.
 - a. Seaming diagrams.
 - 1) Changes at carpet types, patterns, colors, and field seams shall be identified.
 - 3. Samples.
 - a. Provide 18" x 18" sample of each color and pattern selected.
 - b. Provide 200 square inch sample of each color and pattern indicated.
 - c. Provide 200 square inch sample of padding selected (if any).
 - 4. Quality Assurance/Control Submittals:
 - a. Manufacturer's Written Installation Instructions.
 - b. Certificates:
 - 1) Certificates from the manufacturer that the installation was in compliance with manufacturer's written instructions.
 - c. Statement of Installer's Qualifications.
 - 5. Closeout Submittals in accordance with the following:

- a. Maintenance Data (indicating all recommended cleaning and maintenance instructions) in accordance with Specification Section - PROJECT CLOSEOUT.
- b. Project Record Documents in accordance with Specification Section - PROJECT RECORD DOCUMENTS.
- c. Warranty in accordance with this specification and Specification Section - WARRANTIES.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications:

- a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.

B. Regulatory Requirements:

- 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CBC California Building Code (CBC 804.1 and CBC 11B-302.1 and 11B-302.2)
 - b. CDPH California Department of Public Health, "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers"
 - c. NFPA National Fire Protection Agency
 - d. SCAQMD South Coast Air Quality Management District, Rule 1168

C. Meetings:

- 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with all other related work.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 - c. Review delivery, storage and handling procedures.
 - d. Review project conditions.
 - e. Review subfloor preparation procedures.
- 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
- 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, shipping, handling, and unloading:

- 1. Products shall be individually wrapped in the original protective wrapping with legible registration labels indicating manufacturer's name, style, color and dye lot.

B. Storage and protection:

- 1. Products shall be stored in a dry, protected interior area.
 - a. Carpet shall be stored flat and shall not have anything stacked on top.
 - b. Maintain temperature in the storage space between fifty (50) degrees Fahrenheit and ninety (90) degrees Fahrenheit.
 - 1) Seven (7) days prior to installation, acclimate products to environmental requirements of the article titled PROJECT CONDITIONS of this specification section, and the Paragraph titled "Environmental Requirements."

1.6 PROJECT CONDITIONS

A. Environmental requirements:

1. Temperature: Maintain ambient temperature in space to receive products between sixty-eight (68) degrees Fahrenheit and eighty (80) degrees Fahrenheit for seven (7) days prior, during, and seven (7) days minimum following installation.
 - a. Inform the Owner of ambient temperature requirements for products installed and maintain until Substantial Completion and turn-over of the building or facility to the Owner.
2. Humidity: Maintain humidity in space to receive products between 6 percent to 9 percent for four (4) days minimum prior, during, and following installation in accordance with manufacturer's written recommendations.
 - a. Inform the Owner of humidity requirements for products installed and maintain until Substantial Completion and turn-over of the building or facility to the Owner.

B. Existing Conditions:

1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
2. Space shall be dry.
 - a. Concrete slab shall be a minimum of 4 months old.
3. Field Measurements:
 - a. Take and be responsible for field measurements as required.
 - b. Report any significant differences between field dimensions and drawings to Architect.

1.7 WARRANTY

A. Contractor's General Warranty:

1. In accordance with Specification Section - WARRANTIES.

B. Manufacturer's Warranty:

1. In accordance with manufacturer's written standard warranty:
 - a. Broadloom Life of the Carpet.
 - b. Modular Tile Life of the Carpet.
 - c. Walk-Off Fifteen (15) Years.
2. Shall cover Wear, Anti-shock, Edge Ravel, Tuft Bind, Dimensional Stability, Zippering, Static Protection, and Backing Delamination.

C. Installer's Warranty:

1. In accordance with the terms of the specification section - WARRANTIES:
 - a. Warranty Period Two (2) Years.
 - b. Shall be co-endorsed by the General Contractor.

1.8 OWNER'S INSTRUCTIONS

A. Provide the services of a manufacturer's-authorized service representative to demonstrate and train the Owner's maintenance personnel prior to substantial completion as specified below:

1. Proper maintenance and cleaning procedures in accordance with manufacturer's written recommended instructions.

1.9 MAINTENANCE

A. Extra Materials:

1. Broadloom:
 - a. Provide two percent (2 percent) of each color and all salvage pieces over 1 square yard in accordance with Specification Section - PROJECT CLOSEOUT.

2. Modular Tile:
 - a. Provide five percent (5 percent) of each color, in accordance with Specification Section - PROJECT CLOSEOUT.
3. Walk-Off:
 - a. Provide five percent (5 percent) of each color, in accordance with Specification Section - PROJECT CLOSEOUT.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 1. Specified underlayment compound manufacturer:
 - a. ARDEX INCORPORATED
 - b. Acceptable alternative manufacturer: CHEMREX
 - 1) A compatible bonding agent is needed for this product to adhere to the Vapor-Alkalinity Control System and be considered as equivalent.
 2. Specified crack and joint filler manufacturer:
 - a. ARDEX INCORPORATED.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. General:
 1. All materials shall be newly manufactured and of a quality consistent with industry standards and this specification.
 2. Colors and patterns shall be selected from manufacturer's standard line (including premium) except as otherwise specified. See Carpet Schedule at the end of this section for carpet types required.
 3. Carpet shall have integral static protection.
 4. Carpet shall be impervious to water damage.
 5. The stain resistant properties must be permanent and cannot be removed by commercial cleanings or abrasive wear. Test data as follows:
 - a. Red Dye 40 must be released by water only, after exposure to 150,000+ cycles in a tetra pod walker and after sample is allowed to soak in 10:1 solution of water and ammonia.
 6. Topical stain resistant treatments will not be acceptable. Stain resistant properties must be inherent.
 7. Carpet must meet or exceed qualifications for environmental standards of the Carpet and Rug Institute's Green Label Program.

2.3 ACCESSORIES

- A. Underlayment Compound:

1. Provide free-flowing, self-leveling, pumpable, cement based compound (ARDEX K-15) for applications from 1 inch thick to feathered edges, 4,000 psi minimum in accordance with ASTM C 109 "Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)," modified for air cure only.
 - a. ARDEX "K-15."
- B. Crack and Joint Filler:
 1. Provide low viscosity rigid polyurethane filler, tensile strength of 4,000 psi minimum, in accordance with ASTM D 638 "Test method for Tensile Properties of Plastics."
 - a. ARDEX "ARDIFIX."
- C. Concrete Primer (if applicable):
 1. Nonstaining type as recommended in writing by flooring manufacturer.
- D. Adhesives:
 1. Adhesive as recommended in writing by carpet manufacturer.
 2. Compatible with VAPOR-ALKALINITY CONTROL SYSTEM, if installed.
 3. Shall comply with requirements in the place where the project is located.
 4. Shall be non-staining and water and mildew resistant.
 5. Complies with flammability requirements for installed carpet.
 6. Shall bond to non-porous substrate surfaces.
- E. Seaming Cement:
 1. Hot-melt adhesive tape or similar product
 2. Complying with requirements in the place where the project is located.
 3. Recommended in writing by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- F. Tackless Carpet Stripping:
 1. Water-resistant plywood in strips as required to match cushion thickness and that comply with CRI, Section 16.2.
- G. Carpet Base:
 1. Carpet type to match adjacent flooring carpet.
 2. Height: 4".
 3. Provide binding tape on top edge and at exposed vertical ends. Provide full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual, which affect the execution of work under this specification section.
 2. Check sub-floor variation with long straight edge.
 3. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 4. Execution of work under this specification section shall constitute acceptance of existing conditions.
- B. Concrete Subfloors:
 1. Verify that concrete slabs comply with ASTM F 710 "Practice for Preparing Concrete Floors to Receive Resilient Flooring."
 2. Verify that substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond.
 3. Verify that subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
 4. Evaluate the RH (Relative Humidity) and pH (Alkalinity) test results for compliance with adhesives and carpet manufacturer recommendations.

- a. If a Vapor-Alkalinity Control System product has been installed to reduce water vapor emission or phosphates thereby negating the RH and pH test results, evaluate products for compatibility with adhesives and carpet products.
 - 5. Determine adhesion characteristics by performing bond tests recommended by the carpet manufacturer.
 - C. Wood Subfloors:
 - 1. Verify underlayment over subfloor complies with Specification Section - ROUGH CARPENTRY.
 - 2. Verify underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- 3.2 PREPARATION
- A. Coordination:
 - 1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
 - B. Protection:
 - 1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work.
 - C. Surface preparation:
 - 1. General: Comply with CRI, Section 7, "Site Conditions- All Installations" and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.
 - 2. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the carpet manufacturer.
 - a. If a Vapor-Alkalinity Control System has been installed do not remove this system.
 - 3. Use crack and joint filler according to manufacturer's written instructions, to fill cracks, holes, and spalls in substrates.
 - 4. Install self-leveling underlayment compound at depressed or uneven floor conditions.
 - 5. Broom and vacuum clean substrates to be covered immediately before installing carpet.
 - 6. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
 - 7. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 8. Concrete (Previous Flooring Material Removed): Remove existing adhesive by grinding with a concrete grinding machine and moist sand. Do not use solvents to remove adhesive.
- 3.3 INSTALLATION
- A. General:
 - 1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
 - 2. In accordance with approved submittals.
 - 3. In accordance with Regulatory Requirements.
 - B. Layout:
 - 1. Lines shall be straight and true.
 - 2. Refer to Wall and Floor Pattern Drawing(s) in the Interior and Exterior Color Schedules for layout of patterns.
 - C. Carpet Installation:
 - 1. Direct-Glue-Down Installation: Comply with CRI, Section 13, "Direct Glue-Down Installation."
 - 2. Double-Glue-Down Installation: Comply with CRI, Section 14, "Double Glue-Down Installation."
 - 3. Carpet with Attached-Cushion Installation: Comply with CRI, Section 15, "Attached Cushion."

4. Carpet with Pre-applied Adhesive Installation: Comply with CRI, Section 15.4, "Pre-Applied Adhesive Systems (PEEL AND STICK)."
 5. Stretch-in Installation: Comply with CRI, Section 16, "Stretch-in Installation."
 6. Carpet on Stairs Installation: Comply with CRI, Section 17, "Carpet on Stairs."
 7. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - a. Level adjoining edges at seams with hand shears.
 - b. Level adjoining edges.
 8. Do not bridge building expansion joints with carpet.
 9. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosing's. Bind or seal cut edges as recommended in writing by carpet manufacturer.
 10. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
 11. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.
- D. Broadloom:
1. Install carpet cushion seams at 90-degree angle with carpet seams.
- E. Modular Tile:
1. Pattern: Monolithic, unless otherwise noted.
- F. Walk-Off:
1. Pattern: Monolithic, unless otherwise noted.
- G. Carpet Base:
1. Cut and fit carpet base to butt tightly end to end and to floor, changes in wall planes, columns, and cabinets.
 2. Bind edges at exposed ends.

3.4 CLEANING

- A. Perform the following operations immediately after installing carpet:
1. Remove and dispose of debris and recycle all unusable scrap.
 2. Remove excess adhesive and other surface blemishes using cleaner recommended in writing by carpet manufacturer.
 3. Remove yarns that protrude from carpet surface.
 4. Vacuum carpet using commercial machine with face-beater element.

3.5 DEMONSTRATION

- A. In accordance with Specification Section - PROJECT CLOSEOUT.
1. Provide the services of a manufacturer-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.
 - a. Train Owner's maintenance personnel on cleaning procedures and schedules related to cleaning and preventative maintenance.
 - b. Schedule training with the Owner's maintenance personnel with at least seven (7) days advance notice.

3.6 PROTECTION

- A. Protect installed carpet to comply with CRI, Section 20, "Protecting Indoor Installations."
- B. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

3.7 SCHEDULES

- A. Broadloom **BL-1.**
1. Manufacturer: MANNINGTON COMMERCIAL.
 2. Product Name: Carthage Brights.
 3. Physical Characteristics:
 - a. Construction Type: Tufted.
 - b. Fiber Content: 100% nylon 6/6.
 - c. Fiber Type: Invista Antron Legacy.
 - d. Pile Characteristic: Graphic Loop.
 - e. Yarn Count: 1245/2 denier.
 - f. Density: 7,145 oz/cu. yd.
 - g. Pile Height: 0.131 inches.
 - h. Stitches: 12 per inch.
 - i. Gage: 1/10 ends per inch.
 - j. Face Weight: 26 oz/sq. yd.
 - k. Primary Backing: 100% Synthetic.
 - l. Secondary Backing: Ultrabac RE with minimum 10% recycled content.
 - m. Backing System: Ultrabac RE.
 - n. Size: 12' width.
 - o. Soil Resistance Treatment: Xguard.
 - p. Antimicrobial Treatment: Not applicable.
 4. Performance Characteristics:
 - a. Critical Radiant Flux per ASTM E 648 "Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source."
 - 1) Class 1, Not less than 0.45 W/sq. cm.
 - b. Smoke Density per ASTM E 662 "Test method for Specific Optical Density of Smoke Generated by Solid Materials."
 - 1) Less than 450.
 - c. Methenamine Pill Test per ASTM D 2859 "Test method for Ignition Characteristics of Finished Textile Floor Covering Materials."
 - 1) Shall be self-extinguishing.
 - d. Tuft Bind per ASTM D 1335 "Test Method for Tuft Bind of Pile Yarn Floor Coverings."
 - 1) Not less than 10 lbf.
 - e. Delamination per ASTM D 3936 "Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering."
 - 1) Not less than 2.5 lbf/in.
 - f. Electrostatic Propensity: Less than 3.5kV per AATCC 134.
- B. Broadloom **FUSD BL-1.**
1. Manufacturer: TANDUS CENTIVA.
 2. Product Name: "Aftermath II #03026" PowerBond.
 3. Physical Characteristics:
 - a. Construction Type: Stratatec Patterned Loop.
 - b. Fiber System: Dynex SD Nylon / Dynex Nylon.
 - c. Fiber Type: TDX Nylon.
 - d. Dye Method: 90% Solution Dyed / 10% Yarn Dyed.
 - f. Pile Characteristics: Textured Loop.
 - h. Pile Height: 0.187 inches.
 - i. Face Weight: 17 oz / sq. yd.
 - j. Stitches: 8.5 per inch.
 - k. Gage: 5/64
 - l. Primary Backing: Synthetic Non-Woven.
 - m. Secondary Backing: Closed Cell.
 - n. Backing System: PowerBond Cushion.

- p. Soil Resistance Treatment: Ensure.
 - q. Antimicrobial Treatment: Not applicable.
- 4. Performance Characteristics:
 - a. Critical Radiant Flux:Class 1: Not less than 0.45 W/sq. cm per ASTM E648.
 - b. Smoke Density: Less than 450 per ASTM E662.
 - c. Methenamine Pill Test: Shall be self-extinguishing per ASTM D2859.
 - f. Electrostatic Propensity: 1.5kV per AATCC 134.
- C. Broadloom **FUSD BL-2.**
 - 1. Manufacturer: TANDUS CENTIVA.
 - 2. Product Name: "Abrasive Action II #02578" Charcoal #19100 PowerBond.
 - 3. Physical Characteristics:
 - a. Construction Type: Accuweave Patterned Loop.
 - b. Fiber System: Dynex SD Nylon / Dynex Nylon.
 - c. Fiber Type: TDX Nylon.
 - d. Dye Method: Solution Dyed.
 - f. Pile Characteristics: Textured Loop.
 - h. Pile Height: 0.115 inch.
 - i. Face Weight: 17 oz / sq. yd.
 - j. Stitches: 8 per inch.
 - k. Gage: 1/12.
 - l. Primary Backing: Synthetic Non-Woven.
 - m. Secondary Backing: Closed Cell.
 - n. Backing System: PowerBond Cushion.
 - p. Soil Resistance Treatment: Ensure.
 - q. Antimicrobial Treatment: Not applicable.
 - 4. Performance Characteristics:
 - a. Critical Radiant Flux:Class 1: Not less than 0.45 W/sq. cm per ASTM E648.
 - b. Smoke Density: Less than 450 per ASTM E662.
 - c. Methenamine Pill Test: Shall be self-extinguishing per ASTM D2859.
 - f. Electrostatic Propensity: 1.5kV per AATCC 134.
- D. Broadloom **CUSD BL-1.**
 - 1. Manufacturer: TANDUS.
 - 2. Product Name: PowerBond Cushion.
 - 3. Physical Characteristics:
 - a. Construction Type: Level Loop.
 - b. Fiber Content: 100% nylon 6/6.
 - c. Fiber Type: Antron Lumena Nylon.
 - d. Pile Characteristic: Level Loop.
 - e. Density: 110.08 tufts/sq.in.
 - f. Pile Height: 0.117 inches.
 - g. Stitches: 8.60 per inch.
 - h. Gage: 1/13 ends per inch.
 - i. Face Weight: 18 oz/sq. yd.
 - j. Primary Backing: 100% Synthetic.
 - k. Secondary Backing: Closed Cell Cushion.
 - l. Backing System: PowerBond Cushion.
 - m. Size: 6' width.
 - n. Soil Resistance Treatment: Ensure.
 - o. Antimicrobial Treatment: Not applicable.
 - 4. Performance Characteristics:
 - a. Critical Radiant Flux: Class 1, Not less than 0.45 W/sq. cm per ASTM E648.
 - b. Smoke Density: Less than 450 per ASTM E662.
 - c. Methenamine Pill Test: Shall be self-extinguishing per ASTM D2859.
 - d. Tuft Bind: Not less than 10 lbf per ASTM D1335.

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- e. Delamination: Not less than 2.5 lbf/in. per ASTM D3936.
- f. Electrostatic Propensity: Less than 3.5kV per AATCC 134.
- g.
- h.

E. Modular Tile**MT-1.**

- 1. Manufacturer: MANNINGTON COMMERCIAL.
- 2. Product Name: Capstone.
- 3. Physical Characteristics:
 - a. Construction Type: Tufted.
 - b. Fiber Content: 100% nylon 6/6
 - c. Fiber Type: Invista Antron Legacy.
 - d. Pile Characteristic: Patterned Loop.
 - e. Yarn Count: 1245/2 denier.
 - f. Density: 6,315 oz/cu. yd.
 - g. Pile Height: 0.114 inches.
 - h. Stitches: 9.5 per inch.
 - i. Gage: 1/12 ends per inch.
 - j. Face Weight: 20 oz/sq. yd.
 - k. Primary Backing: 100% woven synthetic.
 - l. Secondary Backing: Infinity RE modular reinforced composite close cell polymer.
 - m. Backing System: Infinity RE.
 - n. Size: 24" x 24".
 - o. Soil Resistance Treatment: Xguard.
 - p. Antimicrobial Treatment: mCare.
- 4. Performance Characteristics:
 - a. Critical Radiant Flux per ASTM E 648 "Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source."
 - 1) Class 1, Not less than 0.45 W/sq. cm.
 - b. Smoke Density per ASTM E 662 "Test method for Specific Optical Density of Smoke Generated by Solid Materials."
 - 1) Less than 450.
 - c. Methenamine Pill Test per ASTM D 2859 "Test method for Ignition Characteristics of Finished Textile Floor Covering Materials."
 - 1) Shall be self-extinguishing.
 - d. Tuft Bind per ASTM D 1335 "Test Method for Tuft Bind of Pile Yarn Floor Coverings."
 - 1) Not less than 10 lbf.
 - e. Delamination per ASTM D 3936 "Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering."
 - 1) Not less than 2.5 lbf/in.
 - f. Electrostatic Propensity: Less than 3.5 kV per AATCC 134.

F. Walk-Off**WO-1.**

- 1. Manufacturer: TANDUS CENTIVA.
- 2. Product Name: Abrasive Action.
- 3. Physical Characteristics:
 - a. Construction Type: Tufted.
 - b. Fiber Content: 100% nylon 6/6.
 - c. Fiber Type: TDX Nylon.
 - d. Pile Characteristic: Patterned Loop.
 - e. Yarn Count: 1200/2 denier.
 - f. Density: 7,513 oz/cu. yd.
 - g. Pile Height: 0.187 inches.
 - h. Stitches: 8.0 per inch.

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- i. Gage: 1/12 ends per inch.
 - j. Face Weight: 24 oz/sq. yd.
 - k. Primary Backing: non-woven synthetic fabric.
 - l. Secondary Backing: 100% Recycled content with Tru Bloc.
 - m. Backing System: ER3 Modular Tile.
 - n. Size: 24" x 24".
 - o. Soil Resistance Treatment: Ensure.
 - p. Antimicrobial Treatment: Not applicable.
4. Performance Characteristics:
- a. Critical Radiant Flux per ASTM E 648 "Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source."
 - 1) Class 1, Not less than 0.45 W/sq. cm.
 - b. Smoke Density per ASTM E 662 "Test method for Specific Optical Density of Smoke Generated by Solid Materials."
 - 1) Less than 450.
 - c. Methenamine Pill Test per ASTM D 2859 "Test method for Ignition Characteristics of Finished Textile Floor Covering Materials."
 - 1) Shall be self-extinguishing.
 - d. Tuft Bind per ASTM D 1335 "Test Method for Tuft Bind of Pile Yarn Floor Coverings."
 - 1) Not less than 10 lbf.
 - e. Delamination per ASTM D 3936 "Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering."
 - 1) Not less than 2.5 lbf/in.
 - f. Electrostatic Propensity: Less than 3.5 kV per AATCC 134.

END OF SECTION

SECTION 09 72 00 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all materials, labor, equipment and services necessary to furnish and install all Wall Coverings, accessories, and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded.
 - a. FRP Panel systems.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 06 41 23 MODULAR CASEWORK
 - 4. 09 29 00 GYPSUM BOARD
 - 5. 09 50 00 ACOUSTICAL CEILINGS
 - 6. 09 65 10 RESILIENT BASE AND ACCESSORIES
 - 7. 09 68 40 CARPET
 - 8. 10 44 00 FIRE PROTECTION SPECIALTIES
 - 9. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data.
 - a. Submit manufacturer's full color range (including any standard, premium and custom colors) of all Wall Coverings for selection by the Architect.
 - 2. Samples.
 - a. Provide 6-inch square sample of each Wall Covering product for color and pattern selected.
 - b. Provide 6-inch lineal samples of each Wall Covering trim material specified.
 - c. ~~Custom Graphic Vinyl Wall Covering samples:~~
 - 1) ~~Submit one reduced scale color proof showing the overall image of each mural for approval prior to manufacture.~~
 - 2) ~~Submit 24" x 24" min. ground full strike-off at full scale of each mural design for approval prior to manufacture.~~
 - 3) ~~Submit memo size samples cut from current production of ground wall covering selected to demonstrate quality, weight and embossing.~~
 - 3. Closeout Submittals in accordance with the following:
 - a. Warranty in accordance with Specification Section - WARRANTIES.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 - b. Engage an experienced Installer who is certified in writing by the manufacturer listed herein as qualified to install manufacturer's product (or system) in accordance with manufacturer's warranty requirements.
 - 2. Manufacturer/Supplier Qualifications:

- a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.
 - B. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CBC California Building Code (CBC 803).
- 1.4 DELIVERY, STORAGE, AND HANDLING
- A. Packing, shipping, handling, and unloading:
 - 1. Products shall be individually wrapped.
 - 2. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.
 - B. Acceptance at Site:
 - 1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
 - 2. Damaged products will not be accepted.
 - C. Storage and protection:
 - 1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.
 - a. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.
- 1.5 PROJECT CONDITIONS
- A. Environmental requirements:
 - 1. Temperature: Maintain ambient temperature in space to receive products between sixty (60) degrees Fahrenheit and eighty (80) degrees Fahrenheit for three (3) days prior, during, and three (3) days minimum following installation. Inform the Owner of ambient temperature requirements for products installed and maintain until Substantial Completion and turn-over of the building or facility to the Owner.
 - B. Existing Conditions:
 - 1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
- 1.6 SCHEDULING
- A. Custom Graphic Wallcovering: Verify lead time with manufacturer. Assume no less than six week lead time from approved submittals.
- 1.7 WARRANTY
- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
 - B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.
 - C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
1. Specified FRP Panel product manufacturer:
 - a. CRANE COMPOSITES "Sequentia" with NUDO Trim Accessories.
 - b. Acceptable alternative manufacturers:
 - 1) BP CHEMICALS with NUDO Trim Accessories.
 - 2) MARLITE with NUDO Trim Accessories.
 - 3) NUDO PRODUCTS, INC. with NUDO Trim Accessories.
 - 4) .
 - B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. FRP Panels:
1. Width 48 inches.
 2. Thickness ~~0.075 inches~~ 0.090 inches.
 3. Fire Rating per ASTM E 84 "Standard Test Method for Surface Burning Characteristics of Building Materials": Class C.
 - a. Flame Spread Maximum 175.
 - b. Smoke Developed Maximum 270.
 4. Finish: ~~Pebble finish.~~ Smooth
 5. Color: As selected from manufacturer's standard, premium, and custom color palette.
 6. Accessories:
 - a. Adhesive as recommended in writing by manufacturer that meets the requirements of the place where the Project is located.
 - b. Sealant.
 - 1) Set all perimeter J-Mold trim in a continuous bead of silicon sealant.
 7. Trim:
 - a. Provide inside, outside, division and edge trim moldings as required for the conditions present in the project.
 - b. Material: Aluminum.
 - c. Lengths 96 inches
 - d. Thickness 0.090 inch
 - e. Trim Shapes:
 - 1) J-Mold NUDO A-28.
 - 2) Divider NUDO A-30.
 - 3) Inside Corners NUDO A-32.
 - 4) Outside Corners NUDO A-34.
 - f. Finish: Powder Coated in colors to match the field color of the FRP Panels.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of conditions:

1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual, which affect the execution of work under this specification section.
2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Coordination:

1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.

B. Protection:

1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.

C. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.

3.3 INSTALLATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
2. In accordance with approved submittals.
3. In accordance with Regulatory Requirements.
4. Set plumb, level, and square.

B. Layout:

1. Lines shall be straight and true.

3.4 INSTALLATION OF FRP PANELS

A. Install panels in a full spread of adhesive.

B. Install factory-laminated panels using concealed mounting splines in panel joints.

C. Install trim accessories with adhesive. Do not fasten through panels.

D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

3.5 CLEANING

A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.

1. Clean any soiled surfaces immediately.
2. Finish shall be clean and ready for the application of any additional finishes.
3. In accordance with manufacturer's written instructions and recommendations.

END OF SECTION

SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Provide all material, labor, equipment and services necessary to furnish and install Painting, accessories and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded.
 2. Material and Equipment to be Painted: Paint all piping, unwrapped ductwork, electric conduits exposed to view. Prime and paint all factory finished mechanical and electrical equipment and accessories exposed to view.
 3. Material and Equipment not to be Painted: Do not paint piping, ductwork, equipment and machinery located in attic spaces, above furred or suspended ceilings, in furred pipe or duct spaces. Do not paint factory finished equipment or machinery located in mechanical rooms or mechanical buildings, attics, furred or suspended ceilings.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
1. DIVISION 00 SPECIFICATION SECTIONS.
 2. DIVISION 01 SPECIFICATION SECTIONS.
 3. 05 12 00 STEEL AND FABRICATIONS
 4. 06 41 23 MODULAR CASEWORK
 5. 07 40 00 METAL PANELS
 6. 07 60 00 SHEET METAL (Shop Priming)
 7. 07 72 00 ROOF ACCESSORIES
 8. 07 92 00 SEALANTS
 9. 08 11 00 METAL DOORS AND FRAMES
 10. 08 31 13 ACCESS DOORS AND FRAMES
 11. 08 70 00 HARDWARE
 12. 08 80 00 GLASS
 13. 09 29 00 GYPSUM BOARD
 14. 09 50 00 ACOUSTICAL CEILINGS
 15. 09 65 10 RESILIENT BASE AND ACCESSORIES
 16. 09 68 40 CARPET
 17. 10 05 00 MISCELLANEOUS SPECIALTIES
 18. 10 44 00 FIRE PROTECTION SPECIALTIES
 19. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
1. In accordance with the following standards:
 - a. MPI Master Painters Institute
 - 1) MPI - Architectural Painting Specification Manual.
 - 2) MPI - Maintenance Repainting Manual.
 - a) MPI RSP Master Painters Institute Repaint Surface Preparation Standards, Chapter 6, Section 2.
 - 3) MPI - Glossary.
 - b. PDCA Painting and Decorating Contractors of America, latest edition of the Architectural Specification Manual, as prepared by Specification Services, Inc., Washington State Council of the PDCA.

1.3 DEFINITIONS

- A. The following definitions are just some of the more important definitions used within this section, and were taken from the MPI Glossary Manual, or used to simplify language used by the Architect. These definitions and others stated within the Manual apply for this Specification Section.

1. Acrylic Latex An aqueous dispersion of acrylic resins.
2. Acrylic Resin A/R - Synthetic resins made by polymerizing esters of acrylic acid.
3. A/U Aliphatic Urethane
4. A/A/U Aliphatic Acrylic Urethane
5. Blocking Sticking or bonding together of two painted surfaces that are in direct contact. Most often caused by stacking painted articles before dry or reaching a "block free" (or "non-blocking") stage.
6. DFT Dry Film Thickness – the depth or thickness of a coating in the dry state. Expressed in mils (1/1000 inch) or microns.
7. DRY FALL A Fog Paint designed to be applied by spray and dries fast enough that the overspray will be a dry powder after falling a certain distance. The dust can then be swept or vacuumed up.
8. ODFT "Overall Dry Film Thickness" – the depth or thickness of a complete coating system in the dry state. Expressed in mils (1/1000 inch) or microns.

1.4 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:

1. Product Data.
 - a. Submit manufacturer's full color range, including standard, premium and custom colors, for selection by the Architect.
 - b. Material Safety Data Sheets will be turned over to the Owner in compliance with local rules and regulations, but will not be reviewed.
 - c. Materials List: Format in accordance with Paint Finish Schedule.
 - d. Additional submittals to substantiate proposed equivalent systems.
2. Samples.
 - a. Brushouts: In accordance with Specification Section - SUBMITTAL PROCEDURES.
 - b. For each color and finish selected provide paint brushouts showing color tint graduation of each coat to and including the final color coat.
 - 1) Selected colors and finishes:
 - a) Size: 8 1/2" x 11" boards.
 - b) Quantity: 3 boards of each color and finish.
 - c) Board material wherever possible and for transparent finishes shall be same as material to be finished. Opaque finishes may be on heavy card stock.
3. Closeout Submittals in accordance with the following:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Project Documents in accordance with Specification Section - PROJECT DOCUMENTS.
 - c. Warranty in accordance with Specification Section - WARRANTIES.

1.5 QUALITY ASSURANCE

- A. Qualifications:

1. Material Qualifications:
 - a. Where possible (except for specified materials), paint materials shall be products of only one manufacturer.

- b. All materials, preparation and workmanship shall conform to requirements of the specified edition of the Architectural Painting Specification Manual by the Master Painters Institute (hereafter referred to as the MPI Painting Manual), unless otherwise indicated.
- c. Flame Spread Ratings in accordance with ASTM E 84 "Standard Test Method for Surface Burning Characteristics of Building Materials":
 - 1) Paint finishes in required exit stairways, corridors and exitways must meet flame spread ratings as required by regulatory agencies.
 - 2) Class A - Tunnel Test 0-25 for enclosed required exit stairways and other exit ways.
 - 3) No interior paint or wall finish will be permitted having a tunnel test in excess of 200. All paint materials must be certified that materials meet these requirements.
- d. Manufacturer's Written Instructions - One for the Architect, Contractor and the Owner:
 - 1) Submit three (3) copies of manufacturer's written instructions.
- e. Compatibility:
 - 1) Paint materials and equipment shall be compatible in use.
 - 2) Finish coats shall be compatible with prime coat.
 - 3) Prime coats shall be compatible with surface to be coated.
 - 4) Tools and materials shall be compatible with coating to be applied.
- f. Air Quality:
 - 1) Paint materials and equipment used for application will comply with CARB Air Quality Control Standards in effect at the Project Site and at the time of application.
- 2. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 - 1) Only qualified journeypersons, as defined by local jurisdiction, shall be engaged in painting and decorating work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.
- 3. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.
- B. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CA-CHPS California High Performance Schools
 - b. CAL/OSHA California/Occupational Safety and Health Act
 - c. SCAQMD South Coast Air Quality Management District, Rule 1168
- C. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required for Architect's review. Duplicate finish of approved sample Submittals.
 - 1. Wall Finishes shall be at least 100 sq. ft., suitably marked "MOCKUPS" and protected for the duration of the construction Project.
 - 2. Small areas and items can be selected by the Contractor, suitably marked "MOCKUPS" and protected for the duration of the construction Project.
 - 3. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - 4. Approved mockups (wall areas and small areas or items) may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Meetings:

1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with all other related work.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties and guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at Site:
 1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
 2. Damaged products will not be accepted.
- B. Storage and protection:
 1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units, in a locked, clean and neat, well ventilated area.
 - a. All receiving, opening and mixing shall be done in this area.
 - b. Oily rags and waste shall be removed from area each night and all other precautions shall be taken to avoid danger of fire.
 - c. Empty containers shall not be removed from site, unless otherwise approved by the Architect.
 - d. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.

1.7 PROJECT CONDITIONS

- A. Environmental requirements:
 1. Rain or Fog:
 - a. No work under this section shall be started or maintained under threat of rain.
 - b. Surfaces shall be painted only when they are free from moisture.
 - c. No painting of exterior surfaces shall be done less than 72 hours of actual drying weather after a rain or during periods of dew or fog.
 - d. Perform no painting or decorating work when the maximum moisture content of the substrate exceeds:
 - 1) 12 percent for concrete and masonry (clay and concrete brick / block).
 - 2) 15 percent for wood.
 - 3) 12 percent for plaster and gypsum board.
 - e. Perform no painting or decorating work when the relative humidity is above 85 percent or when the dew point is less than 5 degrees F variance between the air / substrate temperature.
 2. Temperature: No painting shall be done when ambient air and substrate temperatures are below 50 degrees F.
 3. Alkalinity: An alkali level of between 7.0 and 8.5 pH is suitable for painting. Any reading above that level, then the surface shall be neutralized as required for the surface to be painted.

- a. Methods shall be consistent with MPI - Architectural Painting Specification Manual, and shall not result in any adverse condition causing inadequate adhesion, improper curing and drying, or durability of paint system.
 4. No exterior painting shall be done during winds or dusty conditions.
 5. Perform no exterior painting and decorating work unless environmental conditions are within MPI and paint manufacturer's requirements or until adequate weather protection is provided.
 - a. Where required to meet project schedules, suitable weatherproof covering and sufficient heating facilities shall be in place to maintain minimum ambient air and substrate temperatures for 24 hours before, during and after paint application.
 6. Perform no interior painting or decorating work unless adequate continuous ventilation and sufficient heating facilities are in place to maintain minimum ambient air and substrate temperatures above minimum requirements for 24 hours before, during and after paint application.
 - a. Where required to meet project schedules, provide supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- B. Existing Conditions:
1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 2. Concrete and masonry surfaces shall be installed at least 28 days prior to painting and decorating work and shall be visually dry on both sides.
 3. Conduct all moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple cover patch test.
 4. Test concrete, masonry and plaster surfaces for alkalinity as required.
 5. Contractor shall provide a minimum lighting level of 323 Lux (30 foot candles) on surfaces to be painted or decorated.

1.8 WARRANTY

- A. Contractor's General Warranty:
1. In accordance with Specification Section - WARRANTIES.
 - a. Original adherence of all materials and no evidence of any surface defect shall be maintained during warranty period.
 - b. Color at end of warranty period shall remain free from serious fading and any discernible variations shall be uniform.
- B. Manufacturer's Warranty:
1. In accordance with manufacturer's written standard warranty:
 2. Provide Paint Manufacturer's special ten (10) year Material Warranty co-endorsed by the installer for exterior paint application of cement plaster surfaces.
 - a. Warranty period: Ten (10) Years.
 3. Provide Water-Repellent Manufacturer's special Weatherproofing Warranty co-endorsed by the installer for exterior sealer application of concrete or concrete block surfaces.
 - a. Warranty period: Ten (10) Years.
- C. Installer's Warranty:
1. Paint Installer's Warranty:
 - a. Warranty period: Two (2) Years.
 - b. Installer will certify that a Paint Manufacturer's Representative tested the substrate according to Paint Manufacturer's standard procedures and have submitted project information and test patch forms.
 - c. Installer shall certify that Paint Manufacturer's products were installed on the structure in accordance with manufacturer's specification requirements.

- d. Installer further agrees that if installer fails to fulfill their obligation under this certification statement within 30 days notice of the complaint, Paint Manufacturer may proceed with the investigation and repairs and shall pay the entire material cost, providing it wasn't the installer's responsibility.
- 2. Water-Repellent Installer's Warranty:
 - a. Warranty period: Two (2) Years.
 - b. Installer will certify that a Water-Repellent Manufacturer's Representative tested the substrate according to Water-Repellent Manufacturer's standard procedures and have submitted project information and test patch forms.
 - c. Installer shall certify that Water-Repellent Manufacturer's products were installed on the structure in accordance with manufacturer's specification requirements.
 - d. Installer agrees:
 - 1) Investigate all complaints of leakage and/or water absorption on surfaces to which Water-Repellent Manufacturer's weatherproofing products were applied and provide a written report of the cause to Water-Repellent Manufacturer within thirty (30) days of the complaint.
 - 2) Re-apply Water-Repellent Manufacturer's weatherproofing products according to Water-Repellent Manufacturer's standard procedures at installer's cost for labor and material if the leakage and/or water absorption is due to improper surface preparation, application and/or improper use of material.
 - 3) Request authority from Water-Repellent Manufacturer to re-apply Water-Repellent Manufacturer's weatherproofing products at Water-Repellent Manufacturer's expense to areas, which were not rendered hydrophobic due to imperfect weatherproofing materials.
 - e. Installer further agrees that if installer fails to fulfill their obligation under this certification statement within 30 days notice of the complaint, Water-Repellent Manufacturer may proceed with the investigation and repairs and shall pay the entire cost, providing it wasn't the installer's responsibility.

1.9 MAINTENANCE

- A. Extra Materials:
 - 1. Quantity: 10 percent of quantity needed to paint Project, but not to exceed one gallon, of each type and color of finish coat used.
 - 2. Identification: At project completion, provide an itemized list complete with manufacturer, paint type and color coding for all colors used, and locations within the Project for Owner's later use in maintenance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 - 1. Specified paint coating product manufacturer, or approved equivalent:
 - a. PPG PAINTS.

- 1) Composed of the following companies: AMERITONE PAINT, DECRATREND, DEFT, DEVOE COATINGS, DEVOE PAINT, FLOOD WOOD CARE, FULLER O'BRIEN, GLIDDEN, and SINCLAIR PAINT.
- b. Also specified: GEMINI and MONOPOLE.
- c. Acceptable alternative manufacturers:
 - 1) DUNN EDWARDS, KELLY MOORE PAINTS, SHERWIN WILLIAMS, BENJAMIN MOORE and VISTA PAINT. Submittals by these manufacturers, subject to specification requirements, must be in accordance with Section - SUBMITTAL PROCEDURES.
 - a) Paint material quality and systems shall be equal to numbers and systems listed in Paint Finish Schedule at the end of this section.
 - b) If submitted paint numbers differ from Darden Architects, Inc. Paint Equivalency List, additionally submit explanation of difference and certification letter from the installer attesting that the different product is equal to or better than specified; i.e. equivalent or better percentage of solids, system ODFT, and VOC compliant. Paint Equivalency List published by Darden Architects, Inc. is available only for this project at written request.
2. Specified water-borne Alkyltrialkoxo Silane water repellent product manufacturer, or approved equivalent:
 - a. EVONIK DEGUSSA CORPORATION.
3. Specified Graffiti coating manufacturer, or approved equivalent:
 - a. Sacrificial:
 - 1) VISUAL POLLUTION TECH, INC.
 - b. Non-sacrificial:
 - 1) BASF HYDROZO.
 - 2) EVONIK DEGUSSA CORPORATION.
 - 3) THIS STUFF WORKS - TSW
4. Specified Intumescent Paint Manufacturer, or approved equivalent:
 - a. ISOLATEK INTERNATIONAL
5. Specified High Gloss Epoxy Pool Paint and Primer Manufacturer, or approved equivalent:
 - a. RAMUC.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 1. Shop Primers or Coil-Coated Primers: It shall be assumed that all Shop Primed or Coil-Coated primed metals do not meet the requirements for primer material and mil thickness as defined herein. As such, all Shop Primed or Coil-Coated primed metals shall be field primed as indicated in the schedule.
- B. Material Quality: Provide manufacturer's best-quality coating material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 1. All materials used shall be lead and mercury free and shall have low VOC content to meet the applicable standards in the area where the Project is located.
 2. All paint materials shall have good flowing and brushing properties and shall dry or cure free of blemishes, sags, air entrapment, etc.
 3. All Water-Repellent Coatings shall comply with the following:

- a. Provide Alkyltrialkoxo Silane combination with a ratio concentration and application procedure as recommended by the manufacturer with the ability to cover in one or more applications for a ten year warranty in accordance with the following substrates:
 - 1) Thin Brick.
 - 2) Concrete.
 - 3) Concrete Masonry Units
 - 4) Split-Faced Concrete Masonry Units.
 - b. Color: Clear.
 - c. Active Substance: Alkyltrialkoxo Silane.
 - d. Active Content: 100 percent.
 - e. Solvent: Water.
 - f. Flash Point (Concentrate): 93 degrees F.
 - g. Flash Point (Mixed): 200 degrees F.
 - h. Density: 7.77 lbs./gallon.
 - i. VOC (19:1): 50 g/liter (Maximum).
 - j. VOC (9:1): 100 g/liter (Maximum).
 - k. VOC (6:1): 200 g/liter (Maximum).
4. All Bituminous Paint:
- a. Shall comply with Cold-Applied Asphalt-Mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.3 MIXES

A. Mixing and Tinting:

1. Unless otherwise specified herein or pre-approved, all paint shall be ready-mixed and pre-tinted at the factory. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity.
2. Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
3. Where thinner is used, addition shall not exceed paint manufacturer's written recommendations.
4. Do not use kerosene or any such organic solvents to thin water-based paints.
5. Thin paint for spraying in strict accordance with paint manufacturer's written instructions. If directions are not on the container, obtain instructions in writing from the manufacturer and provide one copy of instructions to the Project Inspector.

2.4 FINISHES

A. Finish Colors:

1. Unless otherwise specified herein, all painting work shall be in accordance with MPI Premium Grade finish requirements as a minimum.
2. Determined by Architect prior to or as work progresses.
 - a. Colors to be selected from paint manufacturer's full color systems, including standard, premium and custom colors.
3. When deep or 'Ultra colors' are selected, submit to Architect proposed revision to specified system product numbers, according to manufacturer's written recommendations.
 - a. When deep or ultra colors are selected for use on walls or special color treatments such as graphics or many color changes are desired, the areas and extent of use will be clarified upon request of the Contractor.
4. Gloss standards, in accordance with MPI standards, using the ASTM D 523 "Test for Specular Gloss", are as follows:

Gloss Level	Description	Units at 60 degrees	Units at 85 degrees
G1	Matte or Flat Finish	0 to 5	10 max.
G2	Velvet Finish	0 to 10	10 to 35
G3	Eggshell Finish	10 to 25	10 to 35
G4	Low Sheen or Satin Finish	20 to 35	35 min.
G5	Semi-Gloss Finish	35 to 70	
G6	Gloss Finish	70 to 85	
G7	High-Gloss Finish	Greater than 85	

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of conditions:

1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual that affects the execution of work under this specification section.
 - a. Thoroughly examine (and test as required, if necessary) all conditions and surfaces to be painted and report in writing to the Contractor and the Architect any conditions or surfaces that will adversely affect the work of this section.
 - b. The Installer is responsible for verifying the compatibility of items primed by others and the finish coat or coats required by the Contract Documents. Should an incompatibility occur, the Installer (along with the manufacturer's technical representative) will recommend compatible alternatives for the Architect's approval.
2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Protection before Application:

1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.
2. Removal of Hardware and Miscellaneous Items:
 - a. Coordinate the work with other trades so that they remove electrical outlet and switch plates, mechanical diffusers, escutcheons, registers, surface hardware, fittings, fastenings, and the like prior to starting work under this Section.
 - b. Store during painting work. Coordinate cleaning and reinstallation after painting work is finished.
 - c. Do not use solvent or cleaning agents detrimental to permanent finishes.
 - d. Remove doors before painting to paint bottom and top edges, and then re-hang.
3. Protect adjacent surfaces against damage from painting operations. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
 - a. Protective means include: Drop cloths, shields, masking templates, etc.
 - b. Exterior surfaces include: landscaping, walks, drives, adjacent building surfaces, glazing, aluminum surfaces, etc.
 - c. Interior surfaces include: rating and instruction labels on doors, frames, equipment, piping, etc.

B. Surface preparation:

1. General:

- a. In accordance with MPI Standards.
 - b. Surfaces to be finished shall be clean, dry and free of dirt, passivators, oils, loose paint and any other contamination that would adversely affect adhesion, protective properties or appearance of the coating.
 - c. All oil, grease, dirt or other foreign matter shall be removed by washing with a solution of cleaner and water, rinse and allow to dry.
 - d. If efflorescence, alkali or glazed surfaces exist, neutralize with acid wash followed by thorough water rinsing.
 - 1) Protect all adjacent substrates or materials that could be affected by acid washing or water rinsing. Collect all washing & rinsing residue and dispose of away from structures.
2. Wood Substrates - (New and Repaint Surfaces):
- a. Interior Surfaces: MPI Interior Surface Preparation, Chapter 3, Section 3.
 - b. Exterior Surfaces: MPI Exterior Surface Preparation, Chapter 2, Section 3.
 - c. Fill holes and other imperfections with putty or plastic wood to match natural finish before and after application of prime or seal coat.
 - d. Provide necessary extra treatment over knots, pitch pockets, sappy portions and other defects to produce a proper base for painting.
 - e. Sand down raised grain or rough surfaces.
 - f. Clean surfaces free of dust, soil and other foreign material.
3. Gypsum Board Substrates - (New and Repaint Surfaces):
- a. Interior Surfaces: MPI Interior Surface Preparation, Chapter 3, Section 3.
 - b. Clean surfaces of dirt, laitance, excess mortar and foreign matter.
 - c. Do all necessary minor sanding.
 - d. Fill minor cracks, scratches, holes and nail heads.
4. Plaster Substrates - (New and Repaint Surfaces):
- a. Interior Surfaces: MPI Interior Surface Preparation, Chapter 3, Section 3.
 - b. Exterior Surfaces: MPI Exterior Surface Preparation, Chapter 2, Section 3.
 - c. Clean surfaces of dirt, laitance, excess mortar and foreign matter.
 - d. Neatly patch, flush and smooth, minor cracks, holes, pits and other imperfections in plaster or concrete surfaces.
5. Concrete Substrates - (New and Repaint Surfaces):
- a. Interior Surfaces: MPI Interior Surface Preparation, Chapter 3, Section 3.
 - b. Exterior Surfaces: MPI Exterior Surface Preparation, Chapter 2, Section 3.
 - c. Clean surfaces of dirt, laitance, excess mortar and foreign matter.
 - d. Neatly patch, flush and smooth, minor cracks, holes, pits and other imperfections in plaster or concrete surfaces.
6. Metal Substrates - (New and Repaint Surfaces):
- a. Interior Surfaces: MPI Interior Surface Preparation, Chapter 3, Section 3.
 - b. Exterior Surfaces: MPI Exterior Surface Preparation, Chapter 2, Section 3.
 - c. Shop Primed or Factory Primed Surfaces:
 - 1) Shop Primed or Factory Primed Surfaces are considered "un-primed" due to their mil thicknesses provided, and common incompatibility issues with specified coating system; and are suitable only for protection during transit (shipment and storage) until incorporated into the Project.
 - 2) Remove dust, oil and rust.
 - 3) Sand surface lightly.
 - 4) Touch up imperfections, scratches, surface damage, etc. with the appropriate primer.
 - 5) Field connection welds, soldered joints, burned and abraded portions shall be spot primed with the appropriate primer.
 - d. Coil-Coated Product Surfaces:
 - 1) Coil-Coated Product Surfaces are considered "un-primed" due to their mil thicknesses provided, and the common incompatibility issues with specified

coating system; and are suitable only for protection during shipment and storage until incorporated into the Project.

- 2) Remove dust, oil and rust.
- 3) Touch up imperfections, scratches, surface damage, etc. with the appropriate primer.
- 4) Field connection welds, burned and abraded portions shall be spot primed with the appropriate primer.
- 5) Field apply manufacturer's written recommended primer coat over entire surface compatible with substrate finish and finish coats indicated on the paint schedule.
- e. Un-primed Surfaces:
 - 1) Remove dust, rust, mill scale, grease and foreign matter by sand blasting or wire brushing.
 - 2) Surfaces to be smooth and ready to receive coatings.
- f. Non-Ferrous Metal, Galvanized, Aluminum, and Copper Surfaces:
 - 1) Metal Etch and Solvent Clean per SSPC-SP 1 or clean with TSP or other appropriate cleaner followed by thorough water rinsing.
 - 2) Brush Blast to standards of SSPC-SP 16, or if blasting is not feasible, sand thoroughly, wipe clean and apply a test patch for the coating specified.
 - 3) Allow system to cure at least one week, then test adhesion per ASTM D 3359 "Standard Test Methods for Measuring Adhesion by Tape Test."
7. Concrete Block Surfaces - (New and Repaint Surfaces):
 - a. Interior Surfaces: MPI Interior Surface Preparation, Chapter 3, Section 3.
 - b. Exterior Surfaces: MPI Exterior Surface Preparation, Chapter 2, Section 3.
 - c. Clean and free of all dirt, dust, rust, oil and free from all foreign matter.
 - d. Test for moisture content.
 - 1) Do not coat if moisture is present.
 - 2) Concrete Blocks to be thoroughly dry and cured prior to coating.
 - e. Do not coat Masonry wall if joints are not properly pointed, has excessive mortar drippings cracked units or shows signs of excessive efflorescence.
 - 1) Notify Architect promptly through General Contractor.
 - 2) Do not coat until unsatisfactory and unacceptable Concrete Block surfaces are corrected suitable for coating.
 - f. Do not apply opaque finishes to Concrete Block with airless sprayer unless "backrolled."

3.3 APPLICATION

- A. Standards:
 1. In accordance with MPI Painting Manual.
 2. In accordance with manufacturer's specifications.
- B. Method:
 1. Apply by brush, roller or spray in accordance with MPI Painting Manual and the coating manufacturer's written recommendations except where specified otherwise in Schedule of Paint Finishes.
 2. Painting of doors by rollers shall only be allowed only if the applicator uses a 1/4 inch nap or less roller.
- C. Coatings:
 1. All coatings shall be applied without reduction except as specifically required by label directions, or required to be reduced by this Specification. In such cases, reduction shall be the minimum permitted and shall not exceed VOC limits.
 2. Apply each coat evenly and allow each coat to dry prior to applying succeeding coats. Each coat to have enough consistency to conceal work to which it is applied.
 - a. Follow manufacturer's recommendations for recoat windows when using high performance coatings, epoxys, and urethanes.

3. Cut into a true line and leave smooth and clean without overlapping. Coat doors and windows in open position.
4. Sand finishes on smooth surfaces to assure proper adhesion of subsequent coats.
5. Tint each undercoat a lighter shade to facilitate identification of each coat, if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
6. Apply coating systems so as to obtain not less than the dry film mil thickness recommended by the manufacturer.
7. Sand metal work only as necessary to provide for the complete bonding of coats.
8. Project Inspector to inspect and approve each coat and operation before succeeding coats are applied.
9. Finish work to be free from runs, sags, defective application and improper workmanship.
10. Back prime all woodwork and casework coming in contact with plaster, masonry or concrete immediately upon delivery to project.
11. Post sign promptly following application of coatings.

3.4 FIELD QUALITY CONTROL

- A. All surfaces, preparation and paint applications shall be inspected by the Project Inspector.
- B. Painted exterior and interior surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the Painting Inspection by the Project Inspector:
 1. Brush / Roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
 4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 5. Damage and / or contamination of paint due to blown contaminants (dust, spray paint, etc.).
- C. Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces:
 1. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
 2. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
 3. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
 4. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.
- D. Painted surfaces rejected by the Project Inspector shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.5 CLEANING

- A. Clean in accordance with Specification Section - TEMPORARY FACILITIES AND CONTROLS and PROJECT CLOSEOUT.
- B. Remove all paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- C. Keep work area free from unnecessary accumulation of tools, equipment, surplus materials and debris.

- D. Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- E. Clean equipment and dispose of wash water / solvents as well as all other cleaning and protective materials (e.g., rags, drop cloths, masking papers, etc.), paints, thinners, paint removers / strippers in accordance with the safety requirements of authorities having jurisdiction in the place where the Project is located.
- F. Protect and safeguard work of other trades.

3.6 PROTECTION

- A. Protection from Weather:
 - 1. Protect newly installed work from moisture for a period of time as recommended by the manufacturer after application.
- B. Protection from Traffic:
 - 1. Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.

3.7 SCHEDULES

- A. Refer to Exterior and Interior Finish Schedules on Drawings for applicable finishes used. This is a guide only and paint sub-contractor is responsible to check all drawings and be responsible for all paint work required to cover the complete painting and finishing of the interior and exterior including specialty items.
- B. It is the intent of the specifications and drawings to cover the complete painting and finishing of the Project whether or not it is specifically called for in the Specifications, Schedule of Paint Finishes, or indicated on the Drawings. Surfaces not specified in Paint Finishes Schedule shall be in accordance with manufacturer's written recommendations.
 - 1. Inform the Architect of any changes caused by stricter Air Quality Standards as part of the submittal process.
 - 2. Provide products compliant with Local Air Quality Control District requirements at the time of installation.
- C. Exception: When the Project involves remodel work, the scope of work is limited to the remodel area and adjacent existing substrates to minimize visible color incompatibility.
- D. Provide coating system minimum ODFT specified.
 - 1. Do not apply thicker coats than specified to achieve ODFT. Apply additional coats if necessary for uniform color.
- E. "Ultra Color" Note: A fourth and/or fifth coat may be required to achieve uniform chromatic hue without ghosting from undercoat or substrate.
 - 1. The Contractor shall consider all Metal Paint Finishes noted "Ultra-color" as requiring as many as five (5) total coats.

3.8 INTERIOR PAINT FINISHES:

- A. INTERIOR WOODWORK
 - 1. W-1 Flat Latex Minimum ODFT 4.2 MILS.
 - a. 1st Coat SPEEDHIDE ZERO (SPH-0) Primer 6-4900XI
 - b. 2nd Coat Flat 0 VOC (SPH-0) 6-4110XI
 - c. 3rd Coat Flat 0 VOC (SPH-0) 6-4110XI
 - 2. W-2 Semi-Gloss Acrylic Non-Blocking Enamel Minimum ODFT 4.0 MILS.
 - a. 1st Coat SPEEDHIDE ZERO (SPH-0) Primer 6-4900XI
 - b. 2nd Coat Semi-Gloss 0 VOC (SPH-0) 6-4510XI
 - c. 3rd Coat Semi-Gloss 0 VOC (SPH-0) 6-4510XI

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3. W-3 Gloss Waterborne Acrylic Non-Blocking Enamel Minimum ODFT 9.4 MILS.
 - a. 1st Coat SPEEDHIDE ZERO (SPH-0) Primer 6-4900XI
 - b. 2nd Coat Gloss Acrylic PITT-TECH PLUS 90-1310
 - c. 3rd Coat Gloss Acrylic PITT-TECH PLUS 90-1310
 4. W-4 Semi-Transparent Resin Stain Minimum ODFT 1.9 MILS.
 - a. 1st Coat Resin Wiping Stain DEFT Int. Stain
 - b. 2nd Coat Clear Acrylic DEFT Clear Wood
 5. W-5 Semi-Transparent Resin Stain Minimum ODFT 3.3 MILS.
 - a. 1st Coat Resin Wiping Stain DEFT Int. Stain
 - b. 2nd Coat Clear Acrylic DEFT Clear Wood
 - c. 3rd Coat Clear Acrylic DEFT Clear Wood
 6. W-6 Stained and Water Clear Lacquer Minimum ODFT 3.8 MILS.
 - a. 1st Coat Resin Wiping Stain DEFT Int. Stain
 - b. 2nd Coat Lacq. Sanding Sealer DEFT WB Sanding Sealer
 - c. 3rd Coat Clear Acrylic DEFT WB 109/S
 - d. 4th Coat Clear Acrylic DEFT WB 109/S
 7. W-7 Filled and Sealed Floor Finish Minimum ODFT 3.0 MILS.
 - a. 1st Coat Paste Filler As recommended by Flooring Manufacturer
 - b. 2nd Coat Satin Polyurethane DEFT 26
 - c. 3rd Coat Satin Polyurethane DEFT 26
 8. W-8 Velvet Lacquered Finish Minimum ODFT 4.7 MILS.
 - a. 1st Coat Lacq. Sanding Sealer DEFT WB Sanding Sealer
 - b. 2nd Coat Clear Acrylic DEFT WB 109/S
 - c. 3rd Coat Clear Acrylic DEFT WB 109/S
 - d. 4th Coat Clear Acrylic DEFT WB 109/S
- B. INTERIOR GYPSUM BOARD**
1. DW-1 Flat Latex Minimum ODFT 4.2 MILS.
 - a. 1st Coat SPEEDHIDE ZERO (SPH-0) P/S 6-4900XI
 - b. 2nd Coat Flat 0 VOC (SPH-0) 6-4110XI
 - c. 3rd Coat Flat 0 VOC (SPH-0) 6-4110XI
 2. DW-2 Eggshell Acrylic Non-Blocking Enamel Minimum ODFT 4.0 MILS.
 - a. 1st Coat SPEEDHIDE ZERO (SPH-0) Primer 6-4900XI
 - b. 2nd Coat Eggshell 0 VOC (SPH-0) 6-4310XI
 - c. 3rd Coat Eggshell 0 VOC (SPH-0) 6-4310XI
 3. DW-3 Gloss Acrylic Non-Blocking Enamel Minimum ODFT 9.4 MILS.
 - a. 1st Coat SPEEDHIDE ZERO (SPH-0) Primer 6-4900XI
 - b. 2nd Coat Gloss Acrylic PITT-TECH PLUS 90-1310
 - c. 3rd Coat Gloss Acrylic PITT-TECH PLUS 90-1310
 4. DW-4 Gloss Epoxy Polyamide (Corrosion Resistant) Minimum ODFT 7.6 MILS.
 - a. 1st Coat Acrylic Primer SEAL GRIP 17-921
 - b. 2nd Coat Epoxy Gloss AQUAPON WB-EP 98E-1
 - c. 3rd Coat Epoxy Gloss AQUAPON WB-EP 98E-1
 5. DW-4 WB Semi-Gloss Epoxy (Corrosion Resistant) Minimum ODFT 4.6 MILS.
 - a. 1st Coat Acrylic Primer SEAL GRIP 17-921
 - b. 2nd Coat Epoxy Semi-Gloss PITT-GLAZE 16-510
 - c. 3rd Coat Epoxy Semi-Gloss PITT-GLAZE 16-510
 6. DW-5 Semi-Gloss Acrylic Non-Blocking Enamel Minimum ODFT 4.0 MILS.
 - a. 1st Coat SPEEDHIDE ZERO (SPH-0) Primer 6-4900XI
 - b. 2nd Coat Semi-Gloss 0 VOC (SPH-0) 6-4510XI
 - c. 3rd Coat Semi-Gloss 0 VOC (SPH-0) 6-4510XI
 - d. Note: This system was previous named "DW-2".
- C. INTERIOR CEMENT PLASTER, VENEER PLASTER OR GYPSUM PLASTER**
1. P-1 Flat Latex Minimum ODFT 5.4 MILS.
 - a. 1st Coat Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat Flat 0 VOC (SPH-0) 6-4110XI

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- c. 3rd Coat Flat 0 VOC (SPH-0) 6-4110XI
- 2. P-2 Eggshell Acrylic Non-Blocking Enamel Minimum ODFT 5.6 MILS.
 - a. 1st Coat Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat Eggshell 0 VOC (SPH-0) 6-5310
 - c. 3rd Coat Eggshell 0 VOC (SPH-0) 6-5310
- 3. P-3 Gloss Acrylic Non-Blocking Enamel Minimum ODFT 10.6 MILS.
 - a. 1st Coat Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat Gloss Acrylic PITT-TECH PLUS 90-1310
 - c. 3rd Coat Gloss Acrylic PITT-TECH PLUS 90-1310
- 4. P-4 Gloss Epoxy Polyamide (Corrosion Resistant) Minimum ODFT 7.6 MILS.
 - a. 1st Coat Acrylic Primer SEAL GRIP 17-921
 - b. 2nd Coat Epoxy Gloss AQUAPON WB EP 98E-1 Series
 - c. 3rd Coat Epoxy Gloss AQUAPON WB EP 98E-1 Series
- 5. P-4 WB S/G Epoxy (Corrosion Resistant) Minimum ODFT 4.6 MILS.
 - a. 1st Coat Acrylic Primer SEAL GRIP 17-921
 - b. 2nd Coat WB Epoxy Semi-Gloss PITT-GLAZE 16-510
 - c. 3rd Coat WB Epoxy Semi-Gloss PITT-GLAZE 16-510
- 6. P-5 Semi-Gloss Acrylic Non-Blocking Enamel Minimum ODFT 5.2 MILS.
 - a. 1st Coat Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat Semi-Gloss 0 VOC (SPH-0) 6-4510XI / 6-5510
 - c. 3rd Coat Semi-Gloss 0 VOC (SPH-0) 6-4510XI / 6-5510
- D. INTERIOR CONCRETE OR CONCRETE MASONRY UNITS
 - 1. CB-1 Clear Water Repellent Sealer
 - a. One Coat Alkyltrialkoxo Silane
 - 1) EVONIK DEGUSSA "Aqua-Trete®CONCENTRATE."
 - b. Follow manufacturer's recommended coverage rate and installation recommendations for type of substrate to be covered.
 - c. Provide manufacturer's 10 year warranty for Concrete Masonry Units and Split Faced Concrete Masonry Units.
 - 2. CB-2 Flat Latex - Fine Texture Minimum ODFT 9.9 MILS.
 - a. 1st Coat Acrylic Block Filler (SPH-0) 6 - 7
 - 1) Omit at concrete surfaces.
 - b. 2nd Coat Flat 0 VOC (SPH-0) 6-4110XI
 - c. 3rd Coat Flat 0 VOC (SPH-0) 6-4110XI
 - 3. CB-3 Semi-Gloss Acrylic Enamel:
 - a. Concrete Masonry Units: Minimum ODFT 9.7 MILS.
 - 1) 1st Coat Acrylic Block Filler (SPEEDHIDE INT/EXT BLOCK FILL) 6-7
 - 2) 2nd Coat Flat 0 VOC (SPH-0) 6-4510XI
 - 3) 3rd Coat Flat 0 VOC (SPH-0) 6-4510XI
 - b. Concrete Surfaces: Minimum ODFT 4.6 MILS.
 - 1) -1st Coat Seal Gripper Acrylic Primer-Sealer 17-921XI
 - 2) 2nd Coat Flat 0 VOC (SPH-0) 6-4510XI
 - 3) 3rd Coat Flat 0 VOC (SPH-0) 6-4510XI
 - 4. CB-4 Color High-Gloss Polyamide Epoxy:
 - a. Concrete Masonry Units: Minimum ODFT 15.6 MILS.
 - 1) 1st Coat W/B Epoxy Block Fill SPEEDHIDE HI-FILL INT/EXT BLOCK FILL
 - 2) 2nd Coat Acrylic Primer SEAL-GRIP 17-921
 - 3) 3rd Coat Epoxy Gloss AQUAPON WB EP 98E-1
 - 4) 4th Coat Epoxy Gloss AQUAPON WB EP 98E-1
 - b. Concrete Surfaces: Minimum ODFT 7.6 MILS.
 - 1) 1st Coat Epoxy Primer SEAL-GRIP 17-921
 - 2) 2nd Coat Epoxy Gloss AQUAPON WB EP 98E-1
 - 3) 3rd Coat Epoxy Gloss AQUAPON WB EP 98E-1
 - 5. CB-4 Color WB Semi-Gloss Epoxy:

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- a. Concrete Masonry Units: Minimum ODFT 15.6 MILS.
 - 1) 1st Coat W/B Epoxy Block Fill SPEEDHIDE 6-15
 - 2) 2nd Coat Epoxy Primer SEAL-GRIP 17-921
 - 3) 3rd Coat Epoxy S/G PITT-GLAZE 16-510
 - 4) 4th Coat Epoxy S/G PITT-GLAZE 16-510 DFT 3.0 mils.
 - b. Concrete Surfaces: Minimum ODFT 7.6 MILS.
 - 1) 1st Coat Epoxy Primer SEAL-GRIP 17-921
 - 2) 2nd Coat Epoxy S/G PITT-GLAZE 16-510
 - 3) 3rd Coat Epoxy S/G PITT-GLAZE 16-510
 - 6. CB-5 Clear High-Gloss Polyamide Epoxy Minimum ODFT 5.0 MILS.
 - a. 1st Coat Epoxy Gloss MONOPOLE Permashield 200
 - b. 2nd Coat Epoxy Gloss MONOPOLE Permashield 200
- E. INTERIOR METALS
- 1. PRIMER NOTE: Metals that are shop primed shall be considered "un-primed" and shall be primed with appropriate primer and thicknesses listed below:
 - a. Ferrous Metal:
 - 1) PPG PITT-TECH PLUS 4020 "Red" Mult-Purp. Metal Primer DFT 3.0 mils.
 - b. Non-Ferrous Metal, Galvanized Metal or Aluminum:
 - 1) PPG PITT-TECH PLUS 4020 "White" Mult-Purp. Metal Primer DFT 3.0 mils.
 - 2. COIL-COATED PRODUCTS NOTE: Metal products primed with coil-coated products are to be assumed to be "un-primed" products and shall be additionally coated (or primed again) as follows:
 - a. Coil-Coated Products:
 - 1) Field apply manufacturer's recommended primer coat and mil thickness over entire surface compatible with substrate finish and finish coats indicated on paint schedule.
 - 3. M-1 Flat Latex Minimum ODFT 5.8 MILS.
 - a. 1st Coat Primer See primer note above.
 - b. 2nd Coat Flat 0 VOC (SPH-0) 6-4110XI
 - c. 3rd Coat Flat 0 VOC (SPH-0) 6-4110XI
 - 4. M-2 Semi-Gloss "Ultra Color" Industrial Acrylic Minimum ODFT 11.0 MILS.
 - a. 1st Coat Primer See primer note above.
 - b. 2nd Coat Acrylic Semi-Gloss PITT-TECH PLUS 90-1610
 - c. 3rd Coat Acrylic Semi-Gloss PITT-TECH PLUS 90-1610
 - 5. M-3 Gloss "Ultra Color" Waterborne Acrylic Minimum ODFT 11.0 MILS.
 - a. 1st Coat Primer See primer note above.
 - b. 2nd Coat Gloss Acrylic PITT-TECH PLUS 90-1310
 - c. 3rd Coat Gloss Acrylic PITT-TECH PLUS 90-1310
 - 6. M-4 Semi-Gloss Epoxy Polyamide Minimum ODFT 6.0 MILS.
 - a. 1st Coat Primer See primer note above.
 - b. 2nd Coat Epoxy Semi-Gloss PITT-GLAZE 16-510
 - c. 3rd Coat Epoxy Semi-Gloss PITT-GLAZE 16-510
 - 7. M-5 Gloss Epoxy Polyamide Minimum ODFT 4.6 MILS.
 - a. 1st Coat Epoxy Primer SEAL-GRIP 17-921
 - b. 2nd Coat Epoxy Gloss AQUAPON WB EP 98E-1 Series
 - c. 3rd Coat Epoxy Gloss AQUAPON WB EP 98E-1 Series
 - 8. M-5 Water Base S/G Epoxy (Corrosion Resistant) Minimum ODFT 7.6 MILS.
 - a. 1st Coat Acrylic Primer SEAL GRIP 17-921
 - b. 2nd Coat WB Epoxy S/G PITT-GLAZE 16-510
 - c. 3rd Coat WB Epoxy S/G PITT-GLAZE 16-510
 - 9. M-6 Flat Waterborne Paint Minimum ODFT 4.4 MILS.
 - a. 1st Coat Flat Dry Fall Prime SUPER TECH 6-726XI
 - b. 2nd Coat Flat Dry Fall Finish SUPER TECH 6-726XI

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10. M-7 Semi-Gloss Waterborne Paint Minimum ODFT 4.4 MILS.
 - a. 1st Coat S/G Dry Fall Primer SUPER TECH 6-724XI
 - b. 2nd Coat S/G Dry Fall Finish SUPER TECH 6-724XI
 11. M-8 Satin Industrial Acrylic Minimum ODFT 11.0 MILS.
 - a. 1st Coat Primer See primer note above.
 - b. 2nd Coat Acrylic Satin PITT-TECH PLUS 90-1110
 - c. 3rd Coat Acrylic Satin PITT-TECH PLUS 90-1110
- F. INTERIOR ACOUSTICAL TILE
1. A-1 Matte Flat Vinyl Acrylic Minimum ODFT 1.3 MILS.
 - a. 1st Coat Flat Vinyl Acrylic PRO-EV 0-VOC 12-110
- 3.9 EXTERIOR PAINT FINISHES
- A. EXTERIOR WOOD
1. EW-1 Flat 100 percent Acrylic Minimum ODFT 6.0 MILS.
 - a. 1st Coat Epoxy Primer SEAL-GRIP 17-921
 - b. 2nd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
 - c. 3rd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
 2. EW-2 Semi-Gloss 100 percent Acrylic Minimum ODFT 5.6 MILS.
 - a. 1st Coat Epoxy Primer SEAL-GRIP 17-921
 - b. 2nd Coat 100 percent Acrylic Semi-Gloss SUNPROOF 78-Series
 - c. 3rd Coat 100 percent Acrylic Semi-Gloss SUNPROOF 78-Series
 3. EW-3 100 percent Acrylic Resin (A/R) Stain Minimum ODFT 3.0 MILS.
 - a. 1st Coat 100 percent A/R Stain Coat FLOOD SWF
 - b. 2nd Coat 100 percent A/R Stain Coat FLOOD SWF
- B. EXTERIOR SOFFIT BOARD
1. ESB-1 Lo-Sheen 100 % Acrylic Resin-Heavy Stipple Minimum ODFT 5.8 MILS.
 - a. 1st Coat Epoxy Primer SEAL-GRIP 17-921
 - b. 2nd Coat 100 percent Acrylic Satin SUNPROOF 76-Series
 - c. 3rd Coat 100 percent Acrylic Satin SUNPROOF 76-Series
 - d. *Note: 2nd Coat to have medium size aggregate added to achieve heavy stipple texture.
- C. EXTERIOR CEMENT PLASTER
1. EP-1 Flat 100 percent Acrylic Minimum ODFT 7.0 MILS.
 - a. 1st Coat 100 percent Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
 - c. 3rd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
 2. EP-2 Semi-Gloss 100 percent Acrylic Minimum ODFT 6.6 MILS.
 - a. 1st Coat 100 percent Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat 100 percent Acrylic Semi-Gloss SUNPROOF 78-Series
 - c. 3rd Coat 100 percent Acrylic Semi-Gloss SUNPROOF 78-Series
 3. EP-3 Gloss Styrene Acrylic Minimum ODFT 5.6 MILS.
 - a. 1st Coat 100 percent Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat Gloss ADVANTAGE 900 INT/EXT STYRENE ACRYLIC
 - c. 3rd Coat Gloss ADVANTAGE 900 INT/EXT STYRENE ACRYLIC
 4. EP-4 Smooth Elastomeric, Lo Sheen Acrylic/Resin (A/R) Minimum ODFT 11.9 MILS.
 - a. 1st Coat 100 percent Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat Smooth Elastomeric PITT-FLEX 4-110. Spray and Backroll.
 - c. 3rd Coat 100 percent Acrylic Resin Semi Gloss 76-Series
 5. EP-5 Satin Elastomeric, S/G Acrylic/Resin (A/R) Minimum ODFT 11.8 MILS.
 - a. 1st Coat 100 percent Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat Matte Flex Elastomeric PITT-FLEX 4-110
 - 1) Spray and Backroll
 - c. 3rd Coat 100 percent Acrylic semi-gloss SUNPROOF 78-Series

6. EP-6 Coarse Elastomeric, Satin Acrylic/Resin (A/R) Minimum ODFT 11.8 MILS.
 - a. 1st Coat 100 percent Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat Elastomeric Finish 4-110. Spray and Backroll.
 - c. 3rd Coat 100 percent Acrylic Satin SUNPROOF 76-Series
- D. EXTERIOR CONCRETE OR CONCRETE MASONRY UNITS:
 1. ECB-1 Clear Water Repellent Sealer:
 - a. One Coat Alkyltrialkoxo Silane:
 - 1) EVONIK DEGUSSA "Aqua-Trete®CONCENTRATE."
 - b. Provide manufacturer's 10 year warranty for Concrete Masonry Units and Split Faced Concrete Masonry Units.
 2. ECB-2 Flat 100 percent Acrylic Minimum ODFT 11.5 MILS.
 - a. 1st Coat W/B Acrylic Block Filler SPEEDHIDE 6-7
 - 1) Omit at concrete surfaces
 - b. 2nd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
 - c. 3rd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
 3. ECB-3 Flat 100 percent Acrylic Minimum ODFT 5.5 MILS.
 - a. 1st Coat 100 percent Acrylic Primer-Sealer 4-603XI
 - b. 2nd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
 - c. 3rd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
- E. EXTERIOR METAL
 1. PRIMER NOTE: Metals shop primed shall be considered "un-primed" ☐ and shall be primed with appropriate primer and thicknesses listed below:
 - a. Ferrous Metal, Type 1 Typical:
 - 1) PITT TECH PLUS 4020 "Red" Multi-Purpose Metal Primer DFT 3.0 mils.
 - b. Ferrous Metal, Type 2 as specified in Specification Section – STEEL AND FABRICATIONS:
 - 1) AMERCOAT 68HS Reinforced Inorganic Zinc-Rich Urethane Metal Primer DFT 5.0 mils.
 - c. Ferrous Metal, Type 3 when Urethane is used as a finish:
 - 1) AMERLOCK 2VOC/400 VOC Epoxy Metal Primer DFT 6.0 mils.
 - d. Non-Ferrous Metal, Type 4 Galvanized Metal or Aluminum:
 - 1) PITT TECH PLUS "White" Multi-Purpose Metal Primer DFT 3.0 mils.
 - e. Non-Ferrous Metal, Type 5 Galvanized Metal or Aluminum, when Urethane is used as a finish.
 - 1) AMERLOCK 2VOC/400 VOC Epoxy Metal Primer DFT 6.0 mils.
 2. COIL-COATED PRODUCTS NOTE: Metal products primed with coil-coated products are to be assumed to be unprimed products and shall be re-primed as follows:
 - a. Coil-Coated Products:
 - 1) Field apply manufacturer's recommended primer coat and mil thickness over entire surface compatible with substrate finish and finish coats indicated on paint schedule.
 3. EM-1 Flat 100 percent Acrylic Minimum ODFT 7.4 MILS.
 - a. 1st Coat Primer See primer notes above.
 - b. 2nd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
 - c. 3rd Coat 100 percent Acrylic Flat SUNPROOF 72-Series
 4. EM-2 Semi-Gloss "Ultra Color" 100 percent Acrylic Minimum ODFT 7.2 MILS.
 - a. 1st Coat Primer See primer notes above.
 - b. 2nd Coat 100 percent Acrylic Semi-Gloss SUNPROOF 78-Series
 - c. 3rd Coat 100 percent Acrylic Semi-Gloss SUNPROOF 78-Series
 5. EM-3 Gloss "Ultra Color" 100 percent Acrylic Waterborne Minimum ODFT 11.0 MILS.
 - a. 1st Coat Primer See primer notes above.
 - b. 2nd Coat Gloss Acrylic PITT-TECH PLUS 4216 HP
 - c. 3rd Coat Gloss Acrylic PITT-TECH PLUS 4216 HP

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6. EM-4 Gloss "Ultra Color" Aliphatic Acrylic Urethane (A/A/U) Finish, Spray Applied, Deep Tone, Custom Color Minimum ODFT 16.0 MILS.
 - a. 1st Coat Primer See primer notes above.
 - b. 2nd Coat A/A/U Gloss Color AMERSHIELD VOC
 - c. 3rd Coat A/A/U Gloss Color AMERSHIELD VOC
7. EM-5 Gloss "Ultra Color" Aliphatic High Solids Finish, Spray Applied, Deep Tone, Custom Color with clear protective coats Minimum ODFT 18.0 MILS.
 - a. 1st Coat Primer See primer notes above
 - b. 2nd Coat A/A/U Gloss Color AMERSHIELD VOC
 - c. 3rd Coat A/A/U Gloss Color AMERSHIELD VOC
 - d. 4th Coat A/A/U Gloss Clear AMERSHIELD VOC
 - e. 5th Coat A/A/U Gloss Clear AMERSHIELD VOC
8. EM-6 Semi-Gloss "Ultra Color" Aliphatic Urethane (A/U) Finish, Spray Applied, Deep Tone, Custom Color Finish Minimum ODFT 20.0 MILS.
 - a. 1st Coat Primer See primer notes above.
 - b. 2nd Coat A/A/U Semi-Gloss AMERCOAT 240
 - c. 3rd Coat A/A/U Semi-Gloss AMERSHIELD VOC

3.10 SPECIALTY PAINT FINISHES:

A. PROVIDE SPECIALTY PAINT FINISHES AS SHOWN OR AS FOLLOWS:

1. **Finish No. X-1:** Minimum ODFT 15.0 MILS.
 - a. Lines on Concrete or Asphaltic Concrete Paving Exit and Entrance Signs - 10" width lines, maximum. Reflectorize as required.
 - b. PPG ZoneLine
2. **Finish No. X-2:** Minimum ODFT 15.0 MILS.
 - a. Lines on Walk Top. Colors as selected by Architect.
 - 1) PPG ZoneLine
3. **Finish No. X-3:** Minimum ODFT 2.2 MILS.
 - a. Space above Vents or Grilles.
 - b. 1st Coat 100 percent Acrylic Flat Black 72-Series
4. **Finish No. X-4:** Minimum ODFT 7.0 MILS.
 - a. Piping Black Steel or Cast Iron.
 - b. 1st Coat Multi-Purpose Metal Primer: PITT TECH PLUS 4020 "Red"
 - c. 2nd Coat Acrylic Gloss Finish 2406G
5. **Finish No. X-5:** Minimum ODFT 7.0 MILS.
 - a. Piping Galvanized.
 - b. 1st Coat General Purpose Metal Primer. PITT TECH PLUS 4020 "White"
 - c. 2nd Coat Gloss Enamel Finish: PITT TECH PLUS 90-1310
6. **Finish No. X-6:** Minimum ODFT 11.0 MILS.
 - a. Machinery and Equipment (Coil Coated Products):
 - b. 1st Coat General Purpose Metal Primer: PITT TECH PLUS 4020 "White"
 - c. 2nd Coat Gloss Enamel PITT TECH PLUS 90-1310
 - d. 3rd Coat Gloss Enamel PITT TECH PLUS 90-1310
7. **Finish No. X-7:** Minimum ODFT 7.0 MILS.
 - a. Sheet Metal Ducts:
 - b. 1st Coat General Purpose Metal Primer: PITT TECH PLUS 4020 "White"
 - c. 2nd Coat 100 percent Acrylic Flat: PITT TECH PLUS 90-1310
8. **Finish No. X-8:** Minimum ODFT 7.0 MILS.
 - a. Fire Hydrants:
 - b. 1st Coat General Purpose Metal Primer: PITT TECH PLUS 4020 "White"
 - c. 2nd Coat 100 percent Acrylic Flat: PITT TECH PLUS 90-1310
9. **Finish No. X-9:** Minimum ODFT 7.4 MILS.
 - a. Following items listed will receive Finish No. X-9 (including, but not limited to), Louvers, Grilles, or Access Panels.

- b. 1st Coat General Purpose Metal Primer: PITT TECH PLUS 4020 "White"
- c. 2nd Coat 100 percent Acrylic Flat SUNPROOF FLAT 72-Series
- d. 3rd Coat 100 percent Acrylic Flat SUNPROOF FLAT 72-Series
- 10. **Finish No. X-10:** Minimum ODFT 1.9 MILS.
 - a. Striping under Acoustical Board Surrounding Structure:
 - b. 1st Coat 100 percent Acrylic Flat Black SUNPROOF FLAT 72-Series
- 11. **Finish No. X-11:** Minimum ODFT 2.2 MILS.
 - a. Acoustical Board and Exposed Striping and Structural:
 - b. 1st Coat 100 percent Acrylic Flat Black SUNPROOF FLAT 72-Series
- 12. **Finish No. X-12:**
 - a. Minimum ODFT as recommended by graffiti coating manufacturer.
 - b. Graffiti Coating, non-toxic, liquid, sacrificial wax-based Coating:
 - c. 1st Coat Graffiti Coating:
 - 1) Graffiti-Pruf by VISUAL POLUTION TECH, INC.
 - d. 2nd Coat Graffiti Coating:
 - 1) Only if recommended by manufacturer for substrate material type.
 - 2) Graffiti-Pruf by VISUAL POLUTION TECH, INC.
- 13. **Finish No. X-13 (NOT APPLICABLE).**
- 14. **Finish No. X-14 (NOT APPLICABLE).**
- 15. **Finish No. X-15:**
 - a. Clear Graffiti Coating, non-toxic, liquid, multi-polymer, non-sacrificial, single component sealer by BASF, or approved equivalent: One Coat
 - 1) **NOTE #1:** Test a small area of the existing substrate in an out-of-the-way spot, as determined by the Architect, for compatibility. Inform the Architect if an incompatibility is found for further direction. If found to be compatible, proceed as follows:
 - b. 1st Coat Clear, flat matte coat TAGGUARD by BASF.
 - 1) **NOTE #2:** Follow manufacturer's recommendations for proper installation over various substrates. Applicator must be certified by the manufacturer as an approved applicator for this product over various substrate materials. Protect at least 24 hours minimum the treated surface until manufacturer's recommended curing time has been achieved against graffiti.
 - 2) REMOVAL COAT TAGGUARD Cleaner.
 - 3) **NOTE #3:** Provide remover in small containers equal to 8-16 oz. containers of material for the Owner's use. Instruct the designated representative of the Owner as to proper application of the remover, and all procedures for removing graffiti.
- 16. **Finish No. X-16:** Non-sacrificial, aqueous, silane chemistry, ready-to-use, zero VOC high performance anti-graffiti treatment for masonry, concrete and natural stone, dries clear and will not yellow.
 - a. Follow manufacturer's printed recommendations prior to use.
 - b. Do not apply to wet surfaces. If surface is wet, let dry for a minimum of 24 hours prior to application. Do not use if temperature is below 40 degrees F or above 100 degrees F.
 - c. Protect non-porous surface substrates from overspray. Always do a test patch to confirm the treatment before using to determine if there are any problems prior to full coverage of the porous surfaces.
 - d. Concrete shall be allowed to cure a minimum of 28 days. All pointing or re-pointing shall be completed and allowed to cure for at least 3 days prior to coverage. All patching materials, caulking, sealing materials and traffic paint shall be fully cured before application.
 - e. 1st Coat Clear, flat matte coat PROTECTOSIL ANTIGRAFFITI.
 - 1) 175 to 250 sq. ft. per gallon, diluted by 14 parts of water, using a 1" nap roller.

- f. 2nd Coat Clear, flat matte coat PROTECTOSIL ANTIGRAFFITI.
 - 1) 175 to 250 sq. ft. per gallon, un-diluted, using a 1" nap roller.
- g. 3rd Coat Clear, flat matte coat PROTECTOSIL ANTIGRAFFITI.
 - 1) 175 to 250 sq. ft. per gallon, un-diluted, using a 1" nap roller.
 - 2) 3rd Coat shall always be figured in as part of the Base Bid. 3rd Coat may be deleted if it is determined by all concerned that the two coats were sufficient to protect the surfaces. If not needed, then figure on a credit back to the Owner.
 - 3) Most graffiti removal can be achieved with standard non-hazardous cleaners and low-pressure waterblasting. Contact manufacturer for stubborn markings for removal.
- 17. **Finish No. X-17:** Non-sacrificial, 100 percent active silane treatment with oleophobic additive, clear penetrating breathable VOC Compliant (400 g/L) surface treatment for use on concrete, brick masonry, concrete masonry units and natural stone.
 - a. For flat (horizontal) concrete walks.
 - 1) Manufacturer's printed recommendations for rate of coverage, and type of application method to protect porous surfaces from graffiti and for ease of walk-way clean-up.
 - 2) Follow manufacturer's printed recommendations prior to use.
 - 3) Do not apply to wet surfaces. If surface is wet, let dry for a minimum of 24 hours prior to application. Do not use if temperature is below 40 degrees F or above 100 degrees F.
 - 4) Protect non-porous surface substrates from overspray. Always do a test patch to confirm the treatment before using to determine if there are any problems prior to full coverage of the porous surfaces.
 - 5) Concrete surfaces shall be allowed to cure a minimum of 28 days. All pointing or re-pointing shall be completed and allowed to cure for at least 3 days prior to coverage. All patching materials, caulking, sealing materials and paint shall be fully cured before application.
 - b. 1st Coat Clear, flat matte coat PROTECTOSIL BHN PLUS.
- 18. **Finish No. X-18:** Non-sacrificial, Graffiti Coating, non-toxic, liquid, semi-permanent, acrylic based Coating - Minimum ODFT as recommended by graffiti coating manufacturer.
 - a. For application on sealed surface, including but not limited to CMU scheduled to be sealed, verify compatibility with sealer manufacturer prior to application of Sealer.
 - 1) Only if recommended by manufacturer for substrate material type.
 - 2) For application on natural porous surface, thin first coat with 40 percent water. All other coats shall be full strength.
 - b. 1st Coat Graffiti Coating TSW4.
 - c. 2nd Coat Graffiti Coating TSW4.
 - d. 3rd Coat Graffiti Coating TSW4.
 - e. 4th Coat Graffiti Coating TSW4.
 - f. Provide Manufacturer's recommended TSW2G Graffiti Removal Kit.
- 19. **Finish No. X-19:** Intumescent Paint - Minimum ODFT per fire rating required.
 - a. Primer: Per manufacturer's Written Recommendations, ODFT as required.
 - b. 1st Coat Water Based Polymer, ISOLATEK INTERNATIONAL "CAFCO Spray Film WB3."
 - c. 2nd Coat As required if needed - no greater than 62 mils per coat.
 - d. 3rd Coat As required if needed - no greater than 62 mils per coat.
 - e. 4th Coat Premium Exterior Latex Semi-Gloss GL68XX in thickness as recommended by manufacturer, and in color as selected by the Architect.
- 20. **Finish No. X-20:** Pool Paint High Gloss Epoxy - Minimum ODFT Approximately 3.6 mils.

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- a. Primer: RAMUC "Clean and Prep Solution" per manufacturer's Written Recommendations
- b. 1st Coat Pool Paint by RAMUC
- c. Finish Coat Pool Paint by RAMUC

END OF SECTION

SECTION 10 05 00 – MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provision for and installation of specialty and built-in items required for this Work as indicated on the Drawings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 30 00 CAST-IN-PLACE CONCRETE
 - 4. 05 12 00 STEEL AND FABRICATIONS
 - 5. 06 10 00 ROUGH CARPENTRY
 - 6. 06 41 23 MODULAR CASEWORK
 - 7. 07 60 00 SHEET METAL
 - 8. 08 11 10 METAL DOORS AND FRAMES
 - 9. 08 70 00 HARDWARE
 - 10. 08 80 00 GLASS
 - 11. 09 11 00 METAL FRAMING
 - 12. 09 29 00 GYPSUM BOARD
 - 13. 09 50 00 ACOUSTICAL CEILINGS
 - 14. 09 65 10 RESILIENT BASE AND ACCESSORIES
 - 15. 09 72 00 WALL COVERINGS
 - 16. 09 91 00 PAINTING
 - 17. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 18. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements: It is the intention of this section and the drawings to form a guide for a complete and operable system of all products or systems listed within this specification section. Any items not specifically noted but necessary for a complete and operable product or system shall be provided under this section.

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Shop Drawings:
 - a. Submit Shop Drawings and catalog cuts to the architect showing all details of installation and assembly and all requirements for work by other trades.
 - 2. Product Data:
 - a. Submit manufacturer's full color range (including any standard, premium and custom colors) for selection by the Architect.

1.4 REGULATORY REQUIREMENTS

- A. In accordance with Specification Section - REGULATORY REQUIREMENTS.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage and protection:
 - 1. Use all means necessary to protect all specialty items before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

1.6 PROJECT CONDITIONS

- A. Existing Conditions:
 - 1. Surface Conditions:
 - a. Coordination: Coordinate with all other trades as required to ensure proper and adequate provision in framing and wall finish for the installation of the selected specialties in the locations required.
 - 2. Inspection:
 - a. Prior to Installation, inspect all specific locations and verify that all necessary provisions have been made.
 - b. In the event of discrepancy, immediately notify the Architect.
 - c. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

1.7 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.
- C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period [One (1) Year.][Five (5) years.]

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all specialty items where indicated on the Drawings and in full accordance with all pertinent regulations and the manufacturer's written recommendations, anchoring all components firmly in place for long life under hard use, and in accordance with IR (Interpretation of Regulations, "Division of the State Architect") Manual.

3.2 ADJUSTING

- A. Upon completion of the installation, and as a condition of its acceptance, visually inspect the entire work of this Section, adjust all components for proper alignment and use, and touch up all abrasions and scratches to make them completely invisible.

3.3 SCHEDULES

- A. All items shall be as scheduled or approved equivalent items as set forth in the Substitution Section of these specifications, and all provisions of Division 00 - GENERAL CONDITIONS, and the sections of Division 01.
- B. Corner Guards:
 - 1. Stainless Steel:
 - a. IPC DOOR AND WALL PROTECTION SYSTEMS:
 - 1) Item # 183124C-430, (3-1/2 inch x 3-1/2 inch x 4 feet) 16 gage Stainless Steel, Type 430, corner guards applied with manufacturer's written recommended plastic cement, or approved equivalent.
 - 2. Clear Polycarbonate:
 - a. IPC DOOR AND WALL PROTECTION SYSTEMS:

- 1) Item #421290, (2-1/2" x 2-1/2" x 4' x 2.54 mm thickness), clear polycarbonate 90 degree angle. Install with self-tapping panhead nail screws in pre-drilled mounting holes.

C. Dimensional Letters:

1. Submittals in accordance with Part 1 of this Specification Section, and:
 - a. Sample Dimensional Letter in each finish selected.
 - b. Sample mounting device and accessories.
 - c. Approval by the Architect is required prior to fabrication and installation of all other letters. Sample, upon approval of the Architect, may be incorporated into the work.
2. Fabricated Letters:
 - a. Provide and install Fabricated Letters as manufactured by GEMINI, INC., or approved equivalent.
 - 1) Letters shall have straight edges and buckle free faces.
 - 2) Backer Plate Material: 22-gage Stainless Steel, Type 304.
 - 3) Letter Material: 18-gage Stainless Steel, Type 304.
 - a) Face Finish: Standard #4 Brushed Stainless.
 - b) Edge Finish: Same as Face Finish, unless otherwise indicated.
 - 4) Letter Font: Levenim MT.
 - 5) Letter Size and Thickness: Refer to Contract Documents.
 - 6) Mounting: Refer to Contract Documents.
 - 7) Provide accessories required for a complete system.
3. Cast Letters:
 - a. Provide and install, where shown on the drawings, Cast Letters as manufactured by GEMINI, INC, or approved equivalent.
 - 1) Letter Material: Solid Cast Aluminum Alloy.
 - a) Finish: Baked Enamel.
 - b) Color: Match Architect's sample.
 - 2) Letter Font: Ribbon Deep.
 - 3) Letter Size and Thickness: Refer to Contract Documents.
 - 4) Mounting: Refer to Contract Documents.
 - 5) Provide accessories required for a complete system.
4. Execution in accordance with Part 3 of this Specification Section, and:
 - a. Coordination of mounting condition requirements:
 - 1) Coordinate backing at location receiving Dimensional Letters.
 - b. Coordinate Electrical requirements if applicable.

D. Metal Storage Shelving:

1. Provide REPUBLIC Metal Storage Shelving, manufacturer's standard heavy duty "Clip Shelving System", in sizes and combinations as indicated on the drawings. Provide all parts and accessories ("Angle Posts, sway braces, shelf clips, bin fronts, floor plates, and wall braces for seismic overturning) for a complete, stable shelving system as indicated on the drawings. Shelf units to be Class 2B, with "Shelf Reinforcing Bars" crimped to the front and rear of the shelves. See drawings for number of shelf units required. All components to be #50 gray unless otherwise indicated.

E. Projection Screen:

1. General:
 - a. Submit the following shop drawings:
 - 1) Location of screen centerline.
 - 2) Location of wiring connections.
 - 3) Seams in viewing surfaces.

- b. Provide an extra screen drop with top border matching the viewing surface. Coordinate screen drop distance with ceiling obstructions.
- c. Provide an extra screen drop with a black masking top border. Coordinate screen drop distance with ceiling obstructions.
- 2. Heavy-Duty Manual:
 - a. Provide unit with screen size 6' high x 8' wide "ARTISAN - SERIES M" surface mounted within a box for ceiling installation screens by DRAPER, INC., or approved equivalent. Case to be 7/16" particleboard, 45 lb density, covered with high pressure laminate, color as selected by the Architect from the manufacturer's full color line.
 - b. Viewing surface to be fiberglass matt-white (fiberglass glass beaded), flame and mildew resistant, mounted with one-piece rigid steel roller with "FABRIK-LOK" spline/groove construction to prevent separation of fabric from roller. Bottom of viewing surface to be double-stitch hemmed around hardwood slat.
- 3. Heavy-Duty Motorized:
 - a. Specified product manufacturer, or approved equivalent subject to compliance with requirements: DRAPER, INC. "Access E XL".
 - 1) Acceptable alternative manufacturer:
 - a) DA-LITE SCREEN COMPANY, INC
 - b. Motor and Controls:
 - 1) Standard Voltage:
 - a) Motor: 110-120V AC, 60 Hz, three wire, instantly reversible, lifetime lubricated with pre-set accessible limit switches.
 - b) Controls: power supply key switch.
 - c. Case: Extruded aluminum enclosed case with bottom slot allowing viewing surface passage. White finish.
 - d. Roller: 6 inches (152 mm) diameter steel tube.
 - e. Mounting: Universal mounting brackets for ceiling or above ceiling mounting.
 - f. Projection Viewing Surface:
 - 1) Matt White XT1000 (1.0 gain), with black masking borders.
 - 2) Drop Masking: Black.
 - 3) Drop Height: Coordinate screen drop distance with ceiling obstructions.
 - 4) Flame and mildew resistant.
 - 5) Viewing surface is certified to GREENGUARD standards for low chemical emissions into indoor air during product usage.
 - g. Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at bottom of viewing surface.
 - h. Size of Viewing Surface: 216" w by 121 ½" h. Audio Visual Format: HDTV (16:9).
 - i. Entire unit shall be listed by UL, Inc., and shall bear the UL label.
- F. TV/Monitor Mount Bracket:
 - 1. Fixed Wall Mount:
 - a. Manufacturer: CHIEF MANUFACTURING, INC.
 - b. Product: "Fusion Wall-Fixed Series," coordinate size to match Monitor.
 - c. Features:
 - 1) UL Listed, HCAI Approved.
 - 2) Monitor Types: Universal.
 - 3) Orientation: Landscape.
 - 4) Weight Capacity: Verify model with Monitor.
- G. "Unistrut" Support System:

1. UNISTRUT CHANNEL SYSTEM - The metal framing shall be by UNISTRUT CORPORATION or approved equivalent. Provide Model #P 5500 (and #P 3300SL - Stainless Steel) channels or as noted on the Drawings. Channels shall be 1-5/8" wide with 7/8" continuous slot opening and with in-turned edges to engage spring mounted gripping nuts. Nuts shall be made of hardened steel with serrated grooves to prevent longitudinal movement. Fittings shall be accurately formed from 1/4" thick steel. Channels and fittings shall be cleaned, phosphated and coated with a rust inhibiting custom color enamel paint. Hardware shall be zinc plated in accordance with ASTM B 633 "Specification for Electrodeposited Coatings of Zinc on Iron and Steel", Type SC-1.
 2. Materials used in the manufacture of framing components shall be in accordance with the following:
 - a. Channel Members in accordance with ASTM A 1011 "Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength," SS Grade 33.
 - b. Fittings in accordance with ASTM A 575 "Specification for Steel Bars, Carbon, Merchant Quality, M-Grades."
 - c. Fitting Steel conforms to ASTM A 1011 "Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength," SS Grade 33.
 - d. Channel Nuts in accordance with ASTM A 675 "Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties," Grade 60.
 - e. Bolts in accordance with ASTM A 1011 "Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength", SS Grade 33.
 - f. Screws, SAE J429 Grade 2, and ASTM A 307 "Specification for Carbon Steel Bolts and Standards, 60,000 PSI Tensile Strength."
 3. All Nuts and Bolts 1/2 inch in diameter and greater shall be torqued to a minimum of 50 ft-lbs each.
- H. Resin Logo Signage:
1. Manufacturer: 3-FORM "Chroma", or approved equal.
 2. Material: Resin Panels
 3. Size: 4'x8' Sheet Custom Cut, Refer to Drawings
 4. Thickness: 1/2"
 5. Finish: Vellum
 6. Hardware: Hidden Point Adapter
 7. Installation: Per Manufacturers Written instructions and recommendations.

END OF SECTION

SECTION 10 14 00 – IDENTIFYING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all Identifying Devices Plastic Signs, Acrylic Signs and Decals, materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 30 00 CAST-IN-PLACE CONCRETE
 - 4. 06 10 00 ROUGH CARPENTRY
 - 5. 08 11 00 METAL DOORS AND FRAMES
 - 6. 08 80 00 GLASS
 - 7. 09 22 16 METAL FRAMING
 - 8. 09 29 00 GYPSUM BOARD
 - 9. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 10. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 DEFINITIONS

- A. Definitions pertaining to signage are as follows:
 - 1. Characters Shall mean all letters, numbers, symbols or pictograms.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements for Tactile Signage:
 - 1. Characters and Graphics:
 - a. Finish and Contrast: Characters and their background shall have a non-glare finish. Characters shall contrast with their background, either light characters on a dark background or dark characters on a light background – CBC Section 11B-703.5.1, 11B-703.6.2, and 11B-703.7.1.
 - b. Character Type: Characters on signs shall be raised 1/32-inch (0.794 mm) minimum and letters and numbers shall be sans serif uppercase characters accompanied by contracted (Grade 2) Braille complying with CBC Section 11B-703.3 and Table 11B-703.3.1.
 - c. Character Size: Raised characters (letters and numbers) shall be a minimum of 5/8 inch (15.9 mm) and a maximum of 2 inches (51 mm) high.
 - d. Pictorial symbol signs (pictograms): Pictorial symbol signs (pictograms) shall be accompanied by the verbal description placed directly below the pictogram. the outside dimension of the pictogram field shall be a minimum of 6 inches (152 mm) in height.
 - e. Character Placement: Characters and Braille shall be in a horizontal format. Braille shall be placed a minimum of 3/8 inch (9.5 mm) and a maximum of 1/2 inch (12.7 mm) directly below the tactile characters; flush left or centered. When tactile text is multilined, all Braille shall be placed together below all lines of tactile text.
 - f. Proportions: Raised characters on signs shall be selected from fonts where the width of the uppercase letter "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I." Stroke thickness of the uppercase "I" shall be 15 percent maximum of the height of the character.
 - 1) For Braille Text, capitalization shall conform to CBC Section 11B-703.3.1.

2. Braille:
 - a. California Contracted Grade 2 Braille shall be used wherever Braille is required in other portions of these standards. Braille shall accompany all raised characters – CBC Section 11B-703.3 and Table 11B-703.3.1.
 - 1) Dots shall be rounded or domed.
 - 2) Below measured as a minimum in inches and maximum in inches:
 - 3) Dot Base Diameter: 0.059 (1.5 mm) to 0.063 (1.6 mm).
 - 4) Distance between two dots in the same cell (measured center-to-center): 0.100 (2.5 mm).
 - 5) Distance between corresponding dots in adjacent cells (measured center-to-center): 0.300 (7.6 mm).
 - 6) Dot Height: 0.025 (0.6 mm) to 0.037 (0.9 mm).
 - 7) Distance between corresponding dots from one cell directly below:
 - a) 0.395 (10 mm) to 0.400 (10.2 mm).
 3. Signs shall be installed on the wall adjacent to the latch side of the door.
 - a. Where there is no space on the latch side, including at double leaf doors, signs shall be placed on the nearest adjacent wall, preferably on the right.
 - b. Mounting height shall be as indicated in details on the drawings and in compliance with 11B-703.4.1 and 11B-703.4.2.
 4. Inspection: Signage shall be field inspected after installation per CBC 11B-703.1.1.2.
- B. Performance Requirements: It is the intention of this specification section and the drawings to form a guide for a complete, operable system signage system that is compliant with State and Federal Accessibility Regulations. Any items not specifically noted but necessary for a complete, operable and accessible system shall be provided under this section.

1.4 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
1. Product Data.
 - a. Submit manufacturer's full color range (including any standard, premium and custom colors) for selection by the Architect within thirty days of receipt of the NOTICE TO PROCEED.
 - 1) Provide actual 2-inch x 2-inch sample colors and patterns available from the manufacturers for color selection.
 2. Shop Drawings.
 - a. Submit shop drawings showing fabrication and installation of the work of this section including plans, elevations, sections, details of components, and attachments to other units of work, including accessibility dimensions for mounting heights.
 - b. Submit drawings indicating Room numbers shown on the Contract Documents coordinated with Owner's Room Numbers.
 3. Samples.
 - a. Provide actual 2-inch x 2-inch sample of each sign type specified.
 4. Quality Assurance/Control Submittals:
 - a. Certificates:
 - 1) Submit four (4) copies of certificates.
 - 2) Upon completion of the installation, submit a Certificate from the Contractor (on the Contractor's Letterhead) and co-endorsed by the manufacturer/supplier, sub-contractor/installer that the signage supplied for this project requiring braille complies with the California Contracted Grade 2 Braille and the CBC Section 11B-703.3.

- a) Those attesting to the compliance certificate above shall also acknowledge that they are aware of the Submission Under Penalty Of Perjury per California Government Code Section 12650, et seq, pertaining to false claims, and further know and understand that submission of certification of a false claim may lead to fines, imprisonment and/or other severe legal consequences.
- b. Manufacturer's Instructions:
 - 1) Submit three (3) copies of manufacturer's instructions.
- 5. Closeout Submittals in accordance with the following:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Record Documents in accordance with Specification Section - RECORD DOCUMENTS.
 - c. Warranty in accordance with Specification Section - WARRANTIES and this section.
- 1.5 QUALITY ASSURANCE
 - A. Qualifications:
 - 1. Installer Qualifications:
 - a. Engage an experienced Installer who has been approved by the manufacturer.
 - 2. Manufacturer's/Supplier's Qualifications:
 - a. Firm's experienced in successfully producing/supplying products similar to those indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.
 - B. Regulatory Requirements:
 - 1. In accordance with Specification Section - Regulatory Requirements, and the following:
 - a. ADA Americans with Disabilities Act of 1990.
 - b. CBC California Building Code - California Contracted Grade 2 Braille when required.
 - 2. Inspection: Tactile signs shall be field inspected for compliance after installation (11B-703.1.1.2).
- 1.6 DELIVERY, STORAGE, AND HANDLING
 - A. Packing, shipping, handling, and unloading:
 - 1. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.
 - B. Acceptance at Site:
 - 1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
 - 2. Damaged products will not be accepted.
 - C. Storage and protection:
 - 1. Products shall be stored in a dry, protected area.
 - 2. Products shall be stored in locked storage building.
- 1.7 WARRANTY
 - A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
 - B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.
 - C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
1. Plastic Signs:
 - a. MOHAWK SIGN SYSTEMS.
 - b. Acceptable alternative manufacturer:
 - 1) BEST MANUFACTURING COMPANY.
 2. Acrylic Signs:
 - a. SIGNS OF SUCCESS, INC.
 3. Decals:
 - a. SETON NAME PLATE COMPANY.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Plastic Signs:
1. Interior / Exterior:
 - a. MP (Melamine Plastic) both sides with contrasting phenolic resin core color. The MP shall be scratch resistant, non-static, fire retardant, washable melamine surface laminate with a non-glare surface with artwork and graphics carved into the face surface.
 - b. Performance Requirements:
 - 1) Weight: 1 lb./sq. Ft.
 - 2) Maximum Continuous Operating Temperature: -225 degrees F.
 - 3) Flexural Strength Flat: 25,000 psi.
 - 4) Tensile Strength: 22,000 psi.
 - 5) Compressive Strength Flat: 47,000 psi.
 - 6) Shear Strength: 16,800 psi.
 - 7) Dielectric Strength Short Time: 330 Volts/Mil.
 - a) Per ASTM D 229 "Sheet Plate Electrical Insulation Testing Equipment / Test Resources."
 - 8) NEMA rating: "Self-extinguishing."
 - c. Mylar, Photopolymers and Polymer Materials are not allowed.
 - d. "Sand Carved" MP plates (including phenolic core):
 - 1) Characters and Pictograms/Symbols:
 - a) Style: Tactile Helvetica Regular upper case.
 - b) Tactile: Raised 1/32" from sign face.
 - c) Braille: California Contracted Grade 2 located below characters:
 - d) Style: Framed.
 - e) Corners: Square.
 - 2) Thickness: Approximately 1/8 inch thick.
 - e. Frame and back-up (mounting) plates:
 - 1) Interior Plastic Frames and back-up plates:

- a) High Impact Plastic Styrene frames.
 - b) Back-up plates shall be manufacturer's standard 1/8" thick melamine plastic laminate, suitable for interior use only and mechanical attachment to substrates.
 - c) Corner Style: Square.
 - d) Size: 1/2" deep x 1/8" thick walls.
 - e) Reveal: 3/32", black color.
 - 2) Aluminum Frames and back-up plates:
 - a) Extruded aluminum angle.
 - b) Back-up plates shall be manufacturer's standard 1/8" thick MP Plates suitable for exterior [**and interior**] use, and mechanical attachment to substrates.
 - c) Corner Style: Square.
 - d) Size: 1/2" deep x 1/16" thick walls.
 - e) Reveal: 3/32", black color.
- B. Acrylic Signs:
- 1. Frameless, Profile Material bonded to Substrate Backup Material.
 - a. All signs shall be made of exterior acrylic materials regardless of location (exterior or interior) within the Project.
 - b. Profile Material:
 - 1) GRAVO-TAC "Exterior," modified acrylic material, 1-ply, 1/32 inch, matte finish, integral color as selected by the Architect.
 - c. Substrate Material:
 - 1) 1/4-inch clear cast acrylic backup sheet.
 - 2) Aluminum Frames and back-up plates:
 - a) Extruded aluminum angle.
 - b) Back-up plates shall be manufacturer's standard 1/8" thick aluminum Plates suitable for exterior [**and interior**] use, and mechanical attachment to substrates.
 - c) Corner Style: Square.
 - d) Size: 1/2" deep x 1/16" thick walls.
 - e) Reveal: 3/32", black color.
- C. Decals:
- 1. Provide outdoor grade permanent vinyl material with die cut graphics, characters and self-adhesive back for bonding to clean, smooth surfaces.

2.3 ACCESSORIES

A. Fasteners:

- 1. Concealed Attachment: Provide appropriate flathead countersunk stainless steel screws for the substrate backing in which the sign is to be applied.
- 2. Exposed Attachment – provide appropriate tamper resistant, flathead countersunk stainless steel screws with grommet finish washers for the substrate backing in which the sign is to be applied.
- 3. Adhesive: "Silastic Adhesive."
- 4. Foam Tape: SCOTCH MOUNT FOAM TAPE.

2.4 FABRICATION

A. Shop Assembly:

- 1. Braille Compliance:
 - a. See Part 1 of this specification – SYSTEM DESCRIPTION, and comply with the "Design Requirements for Tactile Signage" that requires California Contracted Grade 2 Braille.

2. Plastic Signs:
 - a. Fabricate the plastic signs and backing plates, and then "Sand Carve" the MP plates in accordance with the manufacturer's recommendations and as indicated. Comply with ADA requirement for symbols and California Contracted Grade 2 Braille characters when required, and finish in accordance to the specifications. All components of the signage system shall be ready to install in the field.
3. Acrylic Signs:
 - a. Manufacturer's standard Profile Material, computer engineered, adhesive backed, raised graphics, complying with the latest CBC and ADA Accessibility Chapters and Sections, and ANSI A 117.1.
 - 1) Pictograms: All symbols shall match as closely as possible the published "International" symbols. Other interpretations will not be deemed acceptable. All symbols shall be approved prior to fabrication.
 - 2) Do not exceed the depth of profiling as recommended by the manufacturer for the thickness of the material to be profiled.

2.5 FINISHES

- A. Plastic Signs:
 1. Finish: Non-glare, face and core as selected by the Architect from the manufacturer's full color line, including any custom colors form complying with the requirements for contrasting colors of field to Symbols and Braille Text.
 2. Allow for two color application without the frame – one color for the field, top and bottom rails, and one color for the characters.
- B. Acrylic Signs:
 1. Finish: Non-glare, face and core as selected by the Architect from the manufacturer's full color line, including any custom colors complying with the requirements for contrasting colors of field to Symbols and Braille Text.
 2. Allow for two-color application – one color for the field, and one color for the characters.
- C. Decals:
 1. Integral non-glare finish from outdoor vinyl and die cut vinyl graphics, characters, in contrasting colors as selected by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other specification sections of this Project Manual which affect the execution of work under this specification section.
 2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Coordination:
 1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work specified under this specification section.
 2. Contractor to provide internal wall blocking for all attached identifying devices.
- B. Protection:
 1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.
- C. Surface preparation:

1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.

3.3 INSTALLATION

A. General:

1. In accordance with manufacturer's written instruction and recommendations unless specifically noted otherwise.
2. In accordance with approved Submittals.
3. In accordance with Regulatory Requirements.
4. Set plumb, level, and square.

B. Layout:

1. Lines of all signs shall be straight and true.
2. Set plumb, level, and square.
3. Temporary positioning with foam tape.

C. Plastic Signs:

1. "Blind" screw the back-up plate with four (4) flathead countersunk screws (minimum) so as not to interfere with face plate. Tape attachment is not allowed.
2. Anchor face plate to back-up plate with Silastic Adhesive for permanent attachment.
3. Seal all exposed edges at exterior conditions with compatible sealant, same color as sign back-up plate.

D. Acrylic Signs:

1. "Blind" screw the back-up plate with four (4) flathead countersunk screws (minimum) so as not to interfere with face plate. Tape attachment is not allowed.
2. Anchor face plate to back-up plate with Silastic Adhesive for permanent attachment.
 - a. Tape attachment is not allowed.
3. Seal all exposed edges at exterior conditions with compatible sealant, same color as sign substrate backup plate.

E. Mounting Conditions:

1. Metal Stud Framed Wall: Provide solid metal backing, attached to studs, adequate for fastening at all corners of sign.
2. Wood Stud Framed Wall: Provide solid wood backing, attached to studs, adequate for fastening at all corners of sign.
3. Concrete and Concrete Masonry: Provide drilled 1/4" diameter concrete or concrete masonry stainless steel anchors at all corner s of signs.
4. Glass: Provide "Silastic Adhesive" for permanent attachment of back-up plate. Provide blank plate of same material and size as the sign itself. Place on opposite side of glass and aligned with sign. Color as selected by the Architect.
5. Door: Fasten to door with tamper resistant flathead countersunk screws, minimum three (3) stainless steel screws with grommet finish washers per sign.

3.4 FIELD QUALITY CONTROL

F. Site Tests:

1. As required by Regulatory Requirements.

3.5 CLEANING

A. Clean in accordance with Specification Sections - TEMPORARY FACILITIES AND CONTROLS and PROJECT CLOSEOUT.

1. Leave area level and free of any ruts or debris. Appearance of earth surface shall be equal to or better than adjacent undisturbed surfaces.
2. Clean any soiled surfaces at the end of each day, minimum.
3. Finish shall be clean and ready for the application of any additional finishes.
4. In accordance with manufacturer's written instructions and recommendations.

3.6 PROTECTION

A. Protection from traffic:

1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.

3.7 SCHEDULES

A. General:

1. All signs with text shall have California Contracted Grade 2 Braille unless otherwise noted.
2. Refer to Plumbing drawings for number and approximate location for "Gas Valve" signs. Signs shall be mounted +2" above Finished Floor.
3. Refer to drawings for various backing requirements.

B. Sign Material:

1. EM = Exterior Metal.
2. IM = Interior Metal.
3. EP = Exterior Plastic.
4. IP = Interior Plastic.
5. A = Acrylic
6. D = Decal.

C. Mounting Condition:

1. 1 = Metal Stud Framed Wall.
2. 2 = Wood Stud Framed Wall.
3. 3 = Concrete or Concrete Masonry.
4. 4 = Glass.
5. 5 = Door Mounted.

D. Sign Types:

1. Sign Type 1 - Accessibility Entrance:
 - a. 7"H x 7" L nominal square shape.
 - 1) 6" high non-Tactile International Symbol of Accessibility required.
 - 2) No Text or Braille required.
2. Sign Type 2 - Toilet Room:
 - a. 3.5" H x 7" L nominal rectangular shape.
 - 1) 3/4" high Tactile Text.
 - a) "XXXXXX" and "RESTROOM".
 - 2) Braille required.
 - b. 12" diameter nominal circular shape ("FEMALE").
 - 1) No Text or Braille required.
 - c. Equilateral triangle shape edges 12" L with vertex upward ("MALE").
 - 1) No Text or Braille required.
 - d. Equilateral triangle shape, superimposed within 12" diameter nominal circular shape ("UNISEX").
 - 1) No Text or Braille required.
3. Sign Type 3 - Occupancy Load:
 - a. 7" h x 15" L nominal rectangular shape.
 - 1) 3/4" high non-Tactile Text required.
 - a) "THE NUMBER OF PEOPLE PERMITTED IN THIS ROOM SHALL NOT EXCEED "XXX" BY ORDER OF THE STATE FIRE MARSHAL"
 - 2) No Braille required.
 - b. 7" h x 15" L nominal rectangular shape.
 - 1) 3/4" high non-Tactile Text required.

- a) "THE NUMBER OF PEOPLE PERMITTED IN THIS ROOM SHALL NOT EXCEED "XXX" FOR DINING OR "XXX" FOR ASSEMBLY BY ORDER OF THE STATE FIRE MARSHAL"
- 2) No Braille required.
4. Sign Type 4 - Assistive Listening:
- a. 7"H x 15"L nominal square shape.
- 1) 6" high tactile International Symbol of Access for Hearing Loss required.
- 2) 5/8" high Tactile Text required.
- 3) No Braille required.
5. Sign Type 5 - Room Identification:
- a. 7" H x 7" L nominal square shape.
- 1) 2" high Tactile Text required.
- 2) Braille required.
- b. 3 1/2" H x 15" L nominal rectangular shape.
- 1) 2" high Tactile Text required.
- 2) Braille required.
- c. 11" H x 15"L nominal rectangular shape.
- 1) 2" high Tactile Text required.
- 2) Braille required.
6. Sign Type 6 - Tactile Identification:
- a. 3-1/2"H x 7"L nominal rectangular shape.
- 1) 3/4" high Tactile Text required.
- 2) Braille required.
- b. 3-1/2"H x 15"L nominal rectangular shape.
- 1) 3/4" high Tactile Text required.
- 2) Braille required.
- c. 7"H x 7"L nominal square shape.
- 1) 3/4" high Tactile Text required.
- 2) Braille required.
- d. 7"H x 15"L nominal rectangular shape.
- 1) 3/4" high Tactile Text required.
- 2) Braille required.
7. Sign Type 7 - Non-Tactile Identification:
- a. 3-1/2"H x 7"L nominal rectangular shape.
- 1) 3/4" high Non-Tactile Text required.
- 2) No Braille required.
- b. 3-1/2"H x 15"L nominal rectangular shape.
- 1) 3/4" high Non-Tactile Text required.
- 2) No Braille required.
- c. 7"H x 7"L nominal square shape.
- 1) 3/4" high Non-Tactile Text required.
- 2) No Braille required.
- d. 7"H x 15"L nominal rectangular shape.
- 1) 3/4" high Non-Tactile Text required.
- 2) No Braille required.
8. Sign Type 8 - Directional:
- a. 3-1/2" H x 15" L nominal rectangular shape.

- 1) Tactile Arrow symbol(s).
- 2) 3/4" high Tactile Text.
- 3) Braille required.
- b. 7" H x 15" L nominal rectangular shape.
 - 1) Tactile Arrow symbol(s).
 - 2) 3/4" high Tactile Text.
 - 3) Braille required.
- c. 11" H x 15" L nominal rectangular shape.
 - 1) Tactile Arrow symbol(s).
 - 2) 3/4" high Tactile Text.
 - 3) Braille required.
- d. 15" H x 15" L nominal square shape.
 - 1) Tactile Arrow symbol(s).
 - 2) 3/4" high Tactile Text.
 - 3) Braille required.
9. Sign Type 9 - Area of Refuge:
 - a. 11" H x 7" L nominal rectangular shape.
 - 1) 5/8" high Tactile Text required.
 - 2) Braille required.
 - 3) 6" high Non-Tactile International Symbol of Accessibility.
10. Sign Type 10 - Stair Identification:
 - a. 13" H x 18" L nominal rectangular shape.
 - 1) 1-1/2" H x 1/4" stroke Tactile Text Stair Identification.
 - 2) 5" High x 3/4" Stroke Tactile Text identifying Floor Level. Floor Level shall be preceded by "M" if Mezzanine Level or "B" if Basement Level.
 - 3) 1" High x 1/4" stroke Tactile Text identifying stairs upper terminus.
 - 4) 1" High x 1/4" stroke identifying stairs upper and lower terminus.
 - 5) 5" High Tactile five pointed star left of floor level shall be provided at level of discharge.
 - b. 13" H x 18" L nominal rectangular shape.
 - 1) 1-1/2" H x 1/4" stroke Tactile Text Stair Identification.
 - 2) 5" High x 3/4" Stroke Tactile Text identifying Floor Level. Floor Level shall be preceded by "M" if Mezzanine Level or "B" if Basement Level.
 - 3) 1" High x 1/4" stroke Tactile Text identifying stairs upper terminus.
 - 4) 1" High x 1/4" stroke identifying stairs upper and lower terminus.

END OF SECTION

SECTION 10 26 00 – WALL AND CORNER GUARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to completely install all Wall and Corner Guard materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 08 11 00 METAL DOORS AND FRAMES
 - 4. 08 14 16 WOOD DOORS
 - 5. 08 15 13 LAMINATE-FACED WOOD DOORS
 - 6. 08 34 73 ACOUSTICAL DOORS AND FRAMES
 - 7. 09 24 00 CEMENT PLASTER
 - 8. 09 26 13 VENEER PLASTER
 - 9. 09 29 00 GYPSUM BOARD
 - 10. 09 72 00 WALL COVERINGS
 - 11. 09 91 00 PAINTING
 - 12. 10 05 00 MISCELLANEOUS SPECIALTIES
 - 13. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. ASTM American Society of Testing Materials
 - b. NFPA National Fire Protection Association

1.3 SYSTEM DESCRIPTION

- A. Design Requirements: In accordance with allowable values and properties assigned and approved by CBC.
- B. Performance Requirements: It is the intention of this section and the drawings to form a guide for a complete and operable system. Any items not specifically noted but necessary for a complete and operable system shall be provided under this section.
 - 1. Fire Performance Characteristics.
 - a. Class A under ASTM E 84 "Test Method for Surface Burning Characteristics of Building Materials":
 - 1) Flame Spread: 25 or less.
 - 2) Smoke Developed: 450 or less.
 - 2. Impact Strength:
 - a. Provide rigid sheet materials that have an Impact Strength of 30.4 ft-lbs/inch of thickness as tested in accordance with the procedures specified in ASTM D 256 "Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics."
 - 3. Chemical and Stain Resistance
 - a. Provide wall protection system components with chemical and stain resistance in accordance with ASTM D 543 "Practices for Evaluating the Resistance of Plastics to Chemical Reagents."
 - 4. Fungal and Bacterial Resistance:

- a. Provide material that does not support fungal or bacterial growth as tested in accordance with ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi."
- 5. Color Consistency:
 - a. Provide components matched in accordance with SAE J-1545 – (Delta E) with a color difference no greater than 1.0 units using CIE Lab, CIE CMC, CIE LCh, Hunter Lab or similar color space scale systems.
- 6. Accessibility Compliance:
 - a. Comply with ADA requirements and requirements of ANSI A117.1.

1.4 SUBMITTALS

A. Submit in accordance with Project Manual Specification Section - SUBMITTAL PROCEDURES:

- 1. Coordination Drawings:
 - a. Submit installer's coordination drawings indicating the work of this section with that of related work of other sections for proper interface of the completed work. Installer shall coordinate and obtain approvals from the work of other related sections prior to submitting to the Architect.
- 2. Product Data.
 - a. Submit manufacturer's full color range (including any standard, premium and custom colors) for selection by the Architect.
 - 1) Provide data for each type of rigid vinyl kickplates specified.
- 3. Shop Drawings.
 - a. Submit shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loading, required clearances, method of field assembly, components, and location and size of each field connection.
- 4. Samples.
 - a. Provide 8-inch square sample of each color and pattern selected.
 - b. Provide 6-inch lineal samples of each piece of trim material specified.
- 5. Closeout Submittals in accordance with Project Manual Division 1 Sections:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Project Record Documents in accordance with Specification Section - PROJECT RECORD Documents.
 - c. Warranty in accordance with Specification Section - WARRANTIES.

1.5 QUALITY ASSURANCE

A. Qualifications:

- 1. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.

B. Regulatory Requirements:

- 1. In accordance with Project Manual Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. ADA Americans with Disabilities Act of 1990.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing, shipping, handling, and unloading:

- 1. Products shall be individually wrapped.
- 2. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.

B. Acceptance at Site:

- 1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.

2. Damaged products will not be accepted.
 - C. Storage and protection:
 1. Products shall be stored in a dry, protected area.
- 1.7 PROJECT CONDITIONS
- A. Environmental requirements:
 1. Temperature: acclimate products in environment between sixty-five (65) degrees Fahrenheit and seventy (70) degrees Fahrenheit for one (1) day prior to installation.
 - B. Existing Conditions:
 1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
- 1.8 WARRANTY
- A. Contractor's General Warranty:
 1. In accordance with Specification Section - WARRANTIES.
 - B. Manufacturer's Warranty:
 1. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period One (1) Year.
 - C. Installer's Warranty:
 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period [One (1) Year.]

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 1. Specified product manufacturer, or approved equivalent:
 - a. INPRO CORPORATION
 - b. KOROSEAL (Division of RJF INTERNATIONAL CORPORATION)
 - c. Acceptable alternative manufacturers:
 - 1) ACROVYN as manufactured by The C/S GROUP
 - 2) KOROSEAL (Division of RJF INTERNATIONAL CORPORATION)
 - B. Products from other manufacturers not listed must submit in accordance with Project Manual Specification Section - SUBSTITUTION PROCEDURES.
- 2.2 MANUFACTURED UNITS
- A. High Impact Wall Covering:
 1. High Impact Wall Covering:
 - a. INPRO "Rigid Vinyl Sheet" Item protective wall covering panels in sizes indicated on the drawings.
 - 1) Provide manufacturer's standard vinyl/ acrylic extrusions in a nominal wall thickness of 0.060".
 - 2) Provide manufacturer's recommended adhesive for the substrate material indicated on the drawings.

- 3) Finish to be manufacturer's matte "Pebblette" finish in color as selected by Architect from manufacturer's full color range.
- 4) Provide the manufacturer's recommended trim pieces and fabricated configurations as required by the drawings.
- b. ACROVYN PVC free protective wall covering panels in sizes indicated on the drawings.
 - 1) Provide manufacturer's standard PETG extrusions in a nominal wall thickness of 0.060".
 - 2) Provide manufacturer's recommended adhesive for the substrate material indicated on the drawings.
 - 3) Finish to be manufacturer's matte finish "Pebblette Grain" in color as selected by Architect from manufacturer's full color range.
 - 4) Provide the manufacturer's written recommended trim pieces and fabricated configurations as required by the drawings.
- c. KOROSEAL "Korogard" protective wall covering panels in sizes indicated on the drawings:
 - 1) Provide manufacturer's standard vinyl/ acrylic extrusions in a nominal wall thickness of 0.060".
 - 2) Provide manufacturer's written recommended adhesive for the substrate material indicated on the drawings.
 - 3) Provide the manufacturer's written recommended trim pieces and fabricated configurations as required by the drawings.

2.3 COMPONENTS

- A. End caps, outside corners and inside corners shall be made of injection molded thermoplastics.
 1. Joints:
 - a. Inside Corners: Color to match wall protection.
 - b. Joint Sealants: Color to match wall protection.

2.4 ACCESSORIES

- A. All mounting system accessories appropriate for substrates indicated on the drawings shall be provided.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual, which affect the execution of work under this specification section.
 2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
 3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 INSTALLATION

- A. General:
 1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
 - a. Provide continuous blocking in walls of similar materials as the wall construction to properly anchor the continuous handrail system at the height indicated on the drawings. Fasteners shall be placed at 32" o.c. maximum.
 2. In accordance with approved submittals.
 3. In accordance with Regulatory Requirements.

4. Set plumb, level, and square.
 - B. Minimum temperature requirements for all products must be +70 deg. F. Relative humidity shall not exceed 80 percent.
 - C. Layout:
 1. Lines shall be straight and true.
- 3.3 CLEANING
- A. Clean in accordance with Project Manual Specification Section - PROJECT CLOSEOUT.
 1. Clean any soiled surfaces immediately.
 2. Clean any soiled surfaces at the end of each day, minimum.
 3. In accordance with manufacturer's written instructions and recommendations.

END OF SECTION

SECTION 10 44 00 – FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to furnish and install Fire Protection Specialties, accessories and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 04 22 00 CONCRETE MASONRY UNITS
 - 4. 09 22 16 METAL FRAMING
 - 5. 09 29 00 GYPSUM BOARD
 - 6. 09 91 00 PAINTING
 - 7. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. NAAMM National Association of Architectural Metal Manufacturers

1.3 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES.
 - 1. Product Data, indicating Project, location in Project for each Model Number for Fire Extinguishers, Fire Blankets, Cabinets, Doors and Trim

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three [3] projects of similar scope and size to that indicated for this Project.
 - 2. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.
- B. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. NFPA National Fire Protection Association (NFPA 10).

1.5 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard warranty:

- a. Warranty Period One (1) Year.
- 2. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
 - a. Failures include, but are not limited to, the following:
 - 1) Failure of hydrostatic test according to NFPA 10.
 - 2) Faulty operation of valves or release levers.
 - a) Warranty Period: Six (6) years from date of Substantial Completion.
- C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period [**One (1) Year.**][**Five (5) years.**]

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 - 1. Specified product manufacturer, or approved equivalent:
 - a. LARSEN'S MANUFACTURING CO.
 - 1) Special hardware when required "Larsen-Loc".
 - 2) FEC-1:
 - a) Non-rated Model #AL 2409-R3.
 - b) Rated Model #AL-FS-2409-R3.
 - c) Fire Extinguisher Model #MP5-A.
 - d) Fire Extinguisher (Science CR and Voc. Shop) Model #MP10.
 - 3) FEC-2:
 - a) Non-rated Model #AL 2409-SM.
 - b) Fire Extinguisher Model #MP5-A.
 - c) Fire Extinguisher (Science CR and Voc. Shop) Model #MP10.
 - 4) FEC-3:
 - a) Non-rated Model #AL 2409-R1.
 - b) Rated Model #AL-FS-2409-R1.
 - c) Fire Extinguisher Model #MP5-A.
 - d) Fire Extinguisher (Science CR and Voc. Shop) Model #MP10.
 - 5) WB-1, General:
 - a) Bracket Model #821.
 - b) Fire Extinguisher Model #MP5-A.
 - 6) WB-1 at Kitchens:
 - a) Bracket Model #1007.
 - b) Fire Extinguisher Model #WC-6L.
 - 7) WB-1 at Science Classrooms and Vocational Shops:
 - a) Bracket Model #846.
 - b) Fire Extinguisher (Science CR and Voc. Shop) Model #MP10.
 - 8) FEBC-1:
 - a) Non-rated Model #AL-FB 3612-RM.
 - b) Rated Model #AL-FS-FB 3612-RM.

- c) Fire Extinguisher Model #MP10.
 - d) Fire Blanket 62" x 80" re-processed wool.
 - 9) FEBC-2:
 - a) Non-rated Model #AL-FB 361-SM.
 - b) Fire Extinguisher Model #MP10.
 - c) Fire Blanket 62" x 80" re-processed wool.
 - b. Acceptable alternative manufacturer:
 - 1) JL INDUSTRIES
- 2. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MANUFACTURED UNITS

A. Cabinet and Extinguisher Types:

- 1. Semi-Recessed "Architectural Series" Type FEC-1.
 - a. Where wall depth is insufficient to accept complete box depth.
 - b. Non-rated: Model No. AL 2409-R3, for rough opening of 25"H x 10-1/2"W x 3"D. Box is to be fabricated from manufacturer's standard heavy gage steel, white baked enamel box. Provide at non-rated walls.
 - c. Fire-Rated: Model No. AL-FS-2409-R3, for rough opening of 26-1/3"H x 11-5/8"W x 3-3/4"D. Box is to be fabricated from manufacturer's standard double wall heavy gage steel, white baked enamel, fire rated box, with approved fire rated barrier material. Provide at one-hour or two-hour rated walls.
 - d. Provide 2-1/2 inch Rolled Edge Trim all around, fabricated from extruded aluminum with a clear satin anodized finish, with all corners mitered.
 - e. Typical Door (1/2" thick) to be "Vertical Duo" with tempered glass. Door to be fabricated from extruded aluminum with a clear satin anodized finish with "Black" Vertical Style Die Cut Lettering indicating "FIRE EXTINGUISHER" placed on the hinge side of the cabinet door.
 - 1) Vandal Resistant Solid Door (1/2 inch thick). Door to be fabricated from extruded aluminum with a clear satin anodized finish with "Black" Vertical Style Die Cut Lettering indicating "FIRE EXTINGUISHER" placed on the hinge side of the cabinet door. Provide Solid Door at the following locations only that are subject to impact and vandalism:
 - a) Corridors.
 - b) Gymnasiums.
 - c) Locker Buildings
 - f. Typical Door Hardware shall include a satin finish pull handle with a self-adjusting roller latch and a continuous piano hinge.
 - 1) Vandal Resistant Hardware: Provide "Larsen-Loc" and factory applied Type A Style lettering near the handle that reads "IN CASE OF FIRE ONLY - PULL FIRMLY ON HANDLE". Provide at the following locations only subject to vandalism:
 - a) Corridors.
 - b) Gymnasiums.
 - c) Locker Buildings
 - g. Provide Multi-Purpose Fire Extinguisher with a UL Rating of 3A-40B:C or 4A-80B:C at Science Classrooms and Vocational Shops.
- 2. Surface Mounted "Architectural Series" Type FEC-2.
 - a. Model No. AL 2409-SM, outside trim dimensions of 27-1/2"H x 13"W x 6"D. Box is to be fabricated from manufacturer's standard clear satin anodized aluminum.
 - 1) Mount with bottom edge 27" above finish floor dimension.

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- b. Typical Door (1/2" thick) to be "Vertical Duo" with tempered glass. Door and trim to be fabricated from extruded aluminum with a clear satin anodized finish with "Black" Vertical Style Die Cut Lettering indicating "FIRE EXTINGUISHER" placed on the hinge side of the cabinet door.
 - 1) Vandal Resistant Solid Door (1/2 inch thick) to be "Solid." Door and trim to be fabricated from extruded aluminum with a clear satin anodized finish with "Black" Vertical Style Die Cut Lettering indicating "FIRE EXTINGUISHER" placed on the hinge side of the cabinet door. Provide at the following locations only that are subject to impact and vandalism:
 - a) Corridors.
 - b) Gymnasiums.
 - c) Locker Buildings
- c. Typical Door Hardware shall include a satin finish pull handle with a self-adjusting roller latch and a continuous piano hinge.
 - 1) Vandal Resistant Hardware: Provide "Larsen-Loc" and factory applied Type A Style lettering near the handle that reads "IN CASE OF FIRE ONLY – PULL FIRMLY ON HANDLE." Provide at the following locations only subject to vandalism:
 - a) Corridors.
 - b) Gymnasiums.
 - c) Locker Buildings
- d. Provide Multi-Purpose Fire Extinguisher with a UL Rating of 3A-40B:C or 4A-80B:C at Science Classrooms and Vocational Shops.
- 3. Fully Recessed "Architectural Series" Type FEC-3.
 - a. Where wall depth is sufficient to accept complete box depth.
 - b. Non-Rated: Model No. AL 2409-R1, for rough opening of 25"H x 10-1/2"W x 5-1/4"D. Box is to be fabricated from manufacturer's standard heavy gage steel, white baked enamel box. Provide at non-rated walls.
 - c. Fire Rated: Model No. AL-FS-2409-R1, for rough opening of 26 1/8"H x 11-5/8"W x 6-1/8"D. Box is to be fabricated from manufacturer's standard heavy gage steel, white baked enamel, fire rated box. Provide at one-hour or two-hour rated walls.
 - d. Provide 5/16 inch Flat Edge Trim all around, fabricated from extruded aluminum with a clear satin anodized finish, with all corners mitered.
 - e. Typical Door (1/2" thick) to be "Vertical Duo" with tempered glass. Door to be fabricated from extruded aluminum with a clear satin anodized finish with "Black" Vertical Style Die Cut Lettering indicating "FIRE EXTINGUISHER" placed on the hinge side of the cabinet door.
 - 1) Vandal Resistant Solid Door (1/2 inch thick). Door to be fabricated from extruded aluminum with a clear satin anodized finish with "Black" Vertical Style Die Cut Lettering indicating "FIRE EXTINGUISHER" placed on the hinge side of the cabinet door. Provide at the following locations only that are subject to impact and vandalism:
 - a) Corridors.
 - b) Gymnasiums.
 - c) Locker Buildings.
 - f. Typical Door Hardware shall include a satin finish pull handle with a self-adjusting roller latch and a continuous piano hinge.
 - 1) Vandal Resistant Hardware: Provide "Larsen-Loc" and factory applied Type A Style lettering near the handle that reads "IN CASE OF FIRE ONLY – PULL FIRMLY ON HANDLE". Provide at the following locations only subject to vandalism:
 - a) Corridors.

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- b) Gymnasiums.
 - c) Locker Buildings
 - g. Provide Multi-Purpose Fire Extinguisher with a UL Rating of 3A-40B:C or 4A-80B:C at Science Classrooms and Vocational Shops.
 - B. Bracket and Extinguisher Type:
 - 1. Surface mounted bracket Type WB-1.
 - a. General:
 - 1) Provide Multi-Purpose Fire Extinguisher with a UL Rating of 3A-40B:C.
 - 2) Model No. 821 extinguisher bracket, constructed of heavy gage steel with a white baked enamel finish.
 - b. Kitchen Locations:
 - 1) Provide Fire Extinguisher Model No. WC-6L (Wet Chemical) with a UL Rating of 2A:K.
 - 2) Provide extinguisher bracket Model No. 1007, constructed of heavy gage steel with a white baked enamel finish.
 - c. Science Classrooms and Vocational Shops:
 - 1) Provide Multi-Purpose Fire Extinguisher with a UL Rating of 4A-80B:C.
 - 2) Model No. 846 extinguisher bracket, constructed of heavy gage steel with a white baked enamel finish.
 - d. Provide backing in wall for attachment of bracket(s).
 - C. Fire Extinguisher, Blanket, and Cabinet Type:
 - 1. Semi-Recessed "Architectural Series" Type FEBC-1.
 - a. Non-Rated: Model No. AL FB 3612-RM, for rough opening of 37"H x 13"W x 4"D. Box is to be fabricated from manufacturer's standard heavy gage steel, white baked enamel box. Provide at non-rated walls.
 - b. Fire Rated: Model No. AL-FS-FB 3612-RM, for rough opening of 38-1/8" H x 14-1/8" W x 4-7/8"D. Box is to be fabricated from manufacturer's standard double wall, heavy gage steel, white baked enamel, fire rated box, with approved fire barrier material. Provide at one-hour or two-hour rated walls.
 - c. Provide 4-1/2 inch Rolled Edge Trim all around, fabricated from extruded aluminum with a clear satin anodized finish, with all corners mitered.
 - d. Door to be "Vertical Duo" with tempered glass. Door to be fabricated from extruded aluminum with a clear satin anodized finish.
 - 1) Vertical Style Die Cut Lettering indicating "FIRE EXTINGUISHER" placed on the hinge side of the cabinet door.
 - 2) Provide "Red" Horizontal Style Die Cut Lettering indicating "FIRE BLANKET" placed near the top section of the cabinet door.
 - e. Typical Door Hardware shall include a satin finish pull handle with a self-adjusting roller latch and a continuous piano hinge.
 - f. Provide Multi-Purpose Fire Extinguisher with a UL Rating of 4A-80B:C.
 - g. Provide a 62" x 80" fire blanket for each cabinet. The Fire Blanket shall be fabricated from a rugged blend of reprocessed wool.
 - 1) Manufacture to the requirements of Fed. Spec. #CS-191-53.
 - 2. Surface Mounted "Architectural Series" Type FEBC-2.
 - a. Model No. AL FB 361-SM, outside dimensions 39-1/2" x 15-1/2" x 8"D. Box is to be fabricated from manufacturer's standard clear satin anodized aluminum. Provide at rated wall conditions where stud depth is less than 6" or at masonry or concrete walls.
 - b. Door to be "Vertical Duo" with tempered glass. Door to be fabricated from extruded aluminum with a clear satin anodized finish.
 - 1) Vertical Style Die Cut Lettering indicating "FIRE EXTINGUISHER" placed on the hinge side of the cabinet door.

- 2) Provide "Red" Horizontal Style Die Cut Lettering indicating "FIRE BLANKET" placed near the top section of the cabinet door.
- c. Typical Door Hardware shall include a satin finish pull handle with a self-adjusting roller latch and a continuous piano hinge.
- d. Provide Multi-Purpose Fire Extinguisher with a UL Rating of 4A-80B:C.
- e. Provide a 62" x 80" fire blanket for each cabinet. The Fire Blanket shall be fabricated from a rugged blend of reprocessed wool.
 - 1) Manufacture to the requirements of Fed. Spec. #CS-191-53.

2.3 FABRICATION

- A. Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Prepare doors and frames to receive locks.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 - 1. Fabricate door frames of one-piece construction, with edges flanged.
 - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.5 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Baked-Enamel Finish: Immediately after cleaning and pre-treating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:
 - 1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual that affect the execution of work under this specification section.
 - a. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.
 - b. Examine walls and partitions for suitable blocking where surface applied brackets will be installed.
 - c. Examine fire extinguishers for proper charging and tagging.
 - 1) Remove and replace damaged, defective, or undercharged units.

2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

- A. Coordination:
 1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
- B. Protection:
 1. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work under this specification section.
- C. Surface preparation:
 1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
 2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.

3.3 INSTALLATION

- A. General:
 1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
 2. In accordance with approved submittals.
 3. In accordance with Regulatory Requirements.
 - a. Comply with all applicable ADA and CBC requirements in regards to accessible mounting heights.
 4. Set plumb, level, and square.
 5. Identification:
 - a. Apply decals, vinyl lettering, or other identification devices at locations indicated.
- B. Layout:
 1. Lines shall be straight and true.

3.4 ADJUSTING

- A. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
 1. Replace cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.5 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
 1. Clean any soiled surfaces immediately.
 2. In accordance with manufacturer's written instructions and recommendations.
 - a. Remove temporary protective coverings and strippable films, if any, as security fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
 - b. Adjust cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
 - c. On completion of cabinet installation, clean interior and exterior surfaces as recommended in writing by manufacturer.

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- d. Touch up marred finishes, or replace cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended in writing or furnished by cabinet manufacturer.

3.6 PROTECTION

A. Protection from traffic:

- 1. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensures the work of this section being without damage or deterioration until the time of Substantial Completion.

END OF SECTION

SECTION 11 40 00- FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Provide all material labor, equipment and services necessary to completely install all Food Service Equipment materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.
- B. The work referred to in this section consists of furnishing all labor and material required to provide and deliver all food service equipment hereinafter specified into the building, uncrate, assemble, hang, set in place, level, and completely install, exclusive of final utility connections. Final utility connections to all equipment, shall be part of the work under additional appropriate sections of the work and not part of the food service work.
1. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. Parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement and repair.
 2. Each refrigeration items specification is written to provide minimum specifications and scope of work. Refrigeration equipment shall be designed and installed to maintain the following general temperature unless otherwise specified.

a. Walk-In Refrigerators	1.7°C / 35°F
b. Walk-In Freezers	-23.2°C / -10°F
c. Reach-In Refrigerators	1.7°C / 35°F
d. Reach-In Freezers	-23.2°C / -10°F
e. Undercounter Refrigerators	1.7°C / 35°F
f. Undercounter Freezers	-23.2°C / -10°F
g. Cold Pan	5°C / 41°F
 3. The materials or products specified herein by trade names, manufacturer's name or catalog number shall be provided as specified. Substitutions will not be permitted unless approved by owner's representative in writing no later than 10 days prior to bidding. This stipulation applies to all equipment and materials. All substitutions or alternates will be expected to perform in all respects as well as the original specification. Should no request for substitution be received and approved as listed above, the project is to be provided as specified.
 4. The food service equipment contractor shall be responsible for all costs associated with the acceptable alternate or approved alternate items, if the item requires additional space or specific utilities that differ from specifications or drawings. The FSEC is responsible for all coordination, documentation and costs associated with any alternate item that was not submitted for approval and accepted by the consultant prior to bid. The FSEC shall be responsible for any costs associated with building changes, utility changes and drawings changes.
- C. Coordinate Owner and Vendor-supplied equipment noted on the drawings or in the specifications as NIFSEC, "not in food service equipment contract." Show on roughing in Plans and sizes, utilities, and other requirements as furnished in the specifications, by owner or appropriate supplier in submittals as if the equipment is contractor furnished.

- D. Bidders shall carefully examine the specifications and the project site including location and condition of existing equipment to determine cost for each "Existing-Reset" and "Existing-Modify" item to cover removal, modification (including materials), cleaning, inspection for damage, repair and resetting.
- E. Field measurements shall be made prior to fabrication or installation of any equipment item.
- F. The cutting of holes in equipment for pipe, drains, electrical outlets, etc., required for this installation, shall be part of this work. Work shall conform to the highest standards of workman-ship and shall include welded sleeves, collars, ferrules and escutcheons.
- G. Repair of all damage to the premises as a result of the equipment installation as well as the removal of all debris left by the work of this section.
- H. Food service equipment and fixtures shall be cleaned and ready for operation at the time the facility is turned over to the Owner for final inspection by the Owner's Representative.
- I. Food Service Equipment Contractor shall be responsible for coordinating with the Architect and Contractor in submitting all applicable documents.
- J. All bidders shall submit with their costing a list of the subcontractors that are included in their bids and a complete "schedule of values" for all equipment and labor.
- K. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 06 41 23 MODULAR CASEWORK
 - 4. 07 60 00 SHEET METAL
 - 5. 09 22 16 METAL FRAMING
 - 6. 09 24 00 CEMENT PLASTER
 - 7. 09 29 00 GYPSUM BOARD
 - 8. 09 30 13 TILE
 - 9. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - a. Refer to Division 22 Sections for water, waste and gas services to the fixtures including shut-off valves, trim, traps, etc., and final connections to the fixtures, except as specified differently in the specifications, drawings, or herein.
 - b. Refer to Division 23 Sections for supply and exhaust fans; exhaust ductwork; service roughing-ins; drain traps; atmospheric vents; valves, pipes, and fittings; fire extinguishing systems; and other materials required to complete food service equipment installation.
 - 1) All hood or ventilator duct work above the connection position on such exhaust hoods or exhaust ventilators, except as specified differently in the specifications, drawings, or herein. Final welded connections at the junction point of exhaust hoods or exhausts ventilators, shall be part of the food service work.
 - c. Refer to Division 26 & 28 Sections for connections to fire alarm systems, wiring, disconnects, and other electrical materials required to complete food service equipment installation.
 - 1) All electric services including wiring to, and final connections to, the fixtures except, as specified differently in the specifications, drawings, or herein.

1.2 DEFINITIONS

- A. Terminology Standard: Refer to NSF 2, "Food Equipment," NSF 4, Heated Cabinets, NSF 7, Refrigerated Equipment, or other applicable NSF standards for definitions of food service equipment and installation terms not otherwise defined in this Section or in other referenced standards.
 - 1. FSEC: Food Service Equipment Contractor
 - 2. Owner-Furnished Equipment: Where indicated, Owner will furnish equipment items.
 - 3. Vendor-Furnished Equipment: Where indicated the Owner's or operator's vendor will furnish equipment items.
 - 4. NIFSEC: Not Included in Food Service Equipment Contract.

1.3 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. AGA American Gas Association
 - b. AISI American Iron and Steel Institute
 - c. ASHRAE American Society of Heating, Refrigerating and Air-conditioning Engineers.
 - d. AWS American Welding Society
 - e. NSF National Sanitation Foundation may have occurred after the preparation of this specification section.
 - f. UL Underwriters Laboratories

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide all material, labor, equipment and services necessary to completely install all Food Service Equipment materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.

1.5 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. General:
 - a. Regardless of drawing formats provided it will remain the responsibility of equipment supplier to develop submittals in accordance with the Specific Conditions and assume all required responsibilities there to.
 - b. The consultant is not to be liable for errors or omissions by the FSEC's use of electronic data provided by the Consultant or the development of data used in the submittal approval process.
 - c. Checking product data, rough-in drawings, wall backing drawings, shop drawings, and refrigeration drawings by Designer is for design concept only, and does not relieve the Food Service Equipment Contractor of responsibility for compliance with Contract Documents, verification of utilities with equipment requirements for conformity and location, verification of all dimensions of equipment and building conditions or reasonable adjustments due to deviations.
 - d. The Food Service Equipment Contractor shall review and provide an affidavit with each submittal that such review has been completed by an authorized agent of the contractor.
 - 2. Product Data.

- a. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.
- 3. Shop Drawings.
 - a. Submit shop drawings from manufacturer and fabricator detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.
- 4. Quality Assurance/Control Submittals:
 - a. Manufacturer's Written Instructions:
 - 1) Submit three (3) copies of manufacturer's written instructions.
 - b. Service Representative Certification:
 - 1) Submit three (3) copies of the Certification of the Service Representative for the Food Service Equipment within a 50-mile radius of the Project Site.
- 5. Closeout Submittals in accordance with Specification Sections in Division One:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Operation Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - c. Project Documents in accordance with Specification Section - PROJECT DOCUMENTS.
 - d. Warranty in accordance with Specification Section -WARRANTIES, and of this specification section.

1.6 QUALITY ASSURANCE

A. Qualifications:

- 1. Material Qualifications:
 - a. Equipment shall be designed in accordance with NSF and AGA and Bear the NSF Seal of Approval and be AGA certified.
- 2. Installer Qualifications:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
 - b. Walk-In Cooler / Freezer Equipment Installer shall be within a 50 mile radius of the Project Site for prompt service during the Installer's Warranty Period..
- 3. Manufacturer/Supplier Qualifications:
 - a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.
 - b. Manufacturers and models listed in the Schedule of Food Service Equipment are used to establish minimum standards for design, performance and construction intended.
 - 1) Fabricators or custom-built equipment shall have qualified personnel, plant and equipment suitable to produce the specified items within the time requirement of the construction schedule.
 - c. Walk-In Cooler / Freezer Equipment Manufacturer shall have and maintain a Certified Service Representative within a 50-mile radius of the Project Site for any warranty issues that may arise during the equipment warranty period.

B. Regulatory Requirements:

- 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CHD Local County Health Department in which the Project is located.

- C. Meetings:
1. Pre- Installation: Scheduled by the Contractor prior to start of equipment installation.
 - a. Coordinate the work with all other related work.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, handling, and unloading:
1. Products shall be individually wrapped.
 2. Products shall be handled in such a manner as to assure that they are free from dents, scratches and other damage.
- B. Acceptance at Site:
1. Products must be in manufacturer's original unopened containers with labels indicating brand name, model, and grade.
 2. No equipment shall be delivered directly to the job site prior to having an installation crew on the premises, except with the written permission of the Architect or the Project Superintendent.
 3. Fabricated equipment shall be shipped in sections to facilitate entry into the building.
 4. Damaged products will not be accepted.
- C. Storage and protection:
1. Products shall be stored in a dry, protected area.
 2. Products shall be stored in locked storage building.
 3. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.
 4. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation.

1.8 PROJECT CONDITIONS

- A. Existing Conditions:
1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 2. Field Measurements:
 - a. Take and be responsible for field measurements as required. Report any significant differences between field dimensions and Drawings to Architect prior to performing Work.
 3. All Work within space shall be complete.

1.9 WARRANTY

- A. Contractor's General Warranty:
 - 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 - 1. In accordance with manufacturer's written standard equipment warranty for each item:
 - a. Warranty Period One (1) Year.
 - b. Manufacturer's to provide standard equipment warranties on all equipment if it exceeds the State of California Standard One Year Construction Warranties.
- C. Installer's Warranty:
 - 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period One (1) Year.
 - b. Installers shall maintain an area Service Representative for the duration of the Service Warranty Period.
 - 1) Installer of the Walk-In Cooler / Freezer Equipment shall provide an area Service Representative within 50 miles of the Project Site.

1.10 OWNER'S INSTRUCTIONS

- A. Provide the services of a factory-authorized service representative to provide start-up service and to demonstrate and train the Owner's maintenance personnel as specified below:
 - 1. Test and adjust controls and any safeties. Replace damaged or malfunctioning controls and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
 - 1. Specified product manufacturer:
 - a. ADVANCE TABCO.
 - b. BUSBOY BY KENLIN, INC.
 - c. DUKE MANUFACTURING CO.
 - d. GROEN.
 - e. HOBART.
 - f. KOLPAK MANUFACTURING CO.
 - g. METRO.
 - h. THE MONTAGUE COMPANY.
 - i. PITCO FRIALATOR, INC.
 - j. SCOTSMAN.
 - k. SERVOLIFT EASTERN CORPORATION.
 - l. SUB-ZERO.
 - m. TRAULSEN & CO., INC.
 - n. WELLS MANFUACTRING COMPANY.

- o. WOLF RANGE COMPANY.
 - 2. Many of the specified product manufacturers listed above are distributed through or could be found through:
 - a. EAGLE/FRIZZELL & ASSOCIATES.
 - b. POULOS & ASSOCIATES.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

- A. Materials for Fabricated Food Service Equipment:
 - 1. General Requirements:
 - a. Manufactured Food Service Equipment to be incorporated as an integral part of Fabricated Food Service Equipment where indicated.
 - b. Provide opening as required for all faucets and provide all faucets as specified.
 - c. Provide all sink-drains complete with 6-inch tailpiece.
 - d. All work straight and uniform, of proper strength and accurately fitted together.
 - e. Level and smooth all plain work.
 - f. All joints to be welded, ground smooth, buffed to No. 4 finish and in accordance with AWS.
 - g. Fabricate to field dimensions. Significant discrepancies with Drawings shall be reported to Architect prior to installation.
 - h. Slope drainboards 1/8 inch per foot to sink.
 - i. Slope sink bottoms 1/2 inch to drain for positive drainage.
 - j. All exposed edges of metal shall be ground round and smooth.
 - k. Sinks, disposer cones and similar to items shall be shop welded integral with top.
 - 2. Materials:
 - a. Stainless Steel in accordance with AISI 18-8, Type 302 with No. 4 finish on all exposed surfaces.
 - 3. Construction:
 - a. Counter Tops and Sinks: 14 gage stainless steel unless otherwise noted.
 - b. Shelves: 16 gage stainless steel unless otherwise noted.
 - 1) Under shelves shall be galvanized iron.
 - c. Legs:
 - 1) 1-5/8 inch outside diameter, 16 gage galvanized iron tuning with galvanized iron leg sockets and concealed thread galvanized iron bullet feet.
 - 2) Drill bottom of feet to receive floor anchor.
 - d. Supports and Stiffeners: 14 gage stainless steel metal channels.
 - e. Spacer: 2 inch wide, 10gage stainless steel Z.
 - f. Fasteners Non-corrosive and tamper proof.

2.3 MANUFACTURED UNITS

- A. General:
 - 1. All plumbing and electrical which is an integral part of manufactured Food Service Equipment shall be complete and operable.
 - 2. All plumbing supply connections shall be complete with female fittings.
 - 3. All drains shall be complete with 6-inch tail piece.
 - 4. All mechanical vents shall be complete with required dampers and ductwork extending a minimum of 3 inches from unit.
 - 5. All motors shall be complete with on-off switch and starter.

6. All electrical connections shall be complete to outlet or junctions box. Connection to junction box and plug to outlet specified in Division 26, Electrical.
7. All equipment shall have NSF seal of approval.
8. Furnish all accessories and components listed in manufacturer's literature as standard with food service equipment specified by model or catalog number.
9. Furnish additional accessories or modifications to equipment as specified in the Fabricated Food Service Equipment Schedule at the end of this section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of conditions:

1. Prior to the execution of the work under this specification section, inspect the installed work executed under other specification sections of this Project Manual which affect the execution of work under this specification section.
2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Coordination:

1. Coordinate work under this specification section with work specified under other specification sections to ensure proper and adequate interface of work specified under this specification section.

3.3 INSTALLATION

A. General:

1. In accordance with manufacturer's written instructions and recommendations unless specifically noted otherwise.
2. In accordance with approved shop drawings.
3. In accordance with Regulatory Requirements and NSF.
4. Set plumb, level and square.
5. Accurately set all equipment.
6. Integrate different items as required for proper interface of equipment.

B. Layout:

1. Lines shall be straight and true.

3.4 ADJUSTING

A. Adjusting:

1. Food Service Equipment representative shall be present at mechanical and electrical check to test all food service equipment.
2. Test and adjust controls and safeties.
3. Replace damaged or malfunctioning controls and equipment.

3.5 CLEANING

- A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
1. Clean any soiled surfaces at the end of each day, minimum.
 2. Finish shall be clean and ready for the application of any additional finishes.
 3. In accordance with manufacturer's written instructions and recommendations.

3.6 DEMONSTRATION

- A. In accordance with Specification Section - PROJECT CLOSEOUT.
1. Provide the services of a factory-authorized service representative to provide start-up service and to demonstrate and train Owner's maintenance personnel as specified below.
 - a. Schedule training with the Owner's maintenance personnel with at least seven (7) days advance notice.
 - b. Train Owner's maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventative maintenance.)
 - c. Review data in "Operating and Maintenance Manuals." Refer to Specification Section – PROJECT CLOSEOUT.

3.7 FABRICATED FOOD SERVICE EQUIPMENT SCHEDULE

- A. WORK COUNTER, SANDWICH PREPARATION** **Item No. 24.**
1. Size: Approximately 9' - 0" long x 3' - 0" wide.
 - a. As shown on the drawings and in accordance with General Requirements.
 - b. Provide bottom shelf full length.
- B. WORK COUNTER & PREPARATION SINKS, LUNCH/VEGETABLE** **Item No. 27.**
1. Size: Approximately 10' - 0" long x 3' - 0" wide.
 - a. As shown on the drawings and in accordance with General Requirements.
 - b. Extend to Item No. 30, weld, finish flush and smooth.
 2. Sinks:
 - a. Tow (2) 20" x 28" x 14" deep sinks with 2" diameter lever waste drawing outlets with chrome plated tail piece.
 3. Waste Disposer:
 - a. Install Waste Disposer in Left-hand drainboard.
 - b. Weld in cone.
 4. Trim:
 - a. Trim: Coordinate installation of two (2) Mixing Faucets, one swing Nozzle and one Pre-Rinse, and Leer Waste Drain Outlets for tow sinks.
- C. SERVICE COUNTER** **Item No. 30.**
1. Size: Approximately 10' - 0" long x 3' - 0" wide.
 - a. As shown on the drawings and in accordance with General Requirements.
 - b. Extend to Item No. 27, weld, finish flush and smooth.
 - c. Provide bottom shelf full length.
- D. SERVICE COUNTER** **Item No. 31.**
1. Size: Approximately 15' - 0" long x 1' - 6" wide.
 - a. As shown on the drawings and in accordance with General Requirements.
 - b. Provide bottom shelf full length.
- E. SERVICE COUNTER** **Item No. 44.**
1. Size: Approximately 7' - 0" long x 2' - 6" wide.

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- a. As shown on Drawings and in accordance with General requirements.
- b. Extend to Item No. 45, miter cut joint, weld, finish flush and smooth.
- c. Provide 2-inch diameter hole for Plastic wire Management Grommet.

F. SERVICE COUNTER**Item No. 45.**

1. Size: Approximately 43' - 0" long x 2' - 6" wide.
 - a. As shown on Drawings and in accordance with General Requirements.
 - b. Extend to Item No. 45, miter cut joint, weld, finish flush and smooth.
 - c. Provide four (4) - 2-inch diameter hole for Plastic Wire Management Grommets.

3.8 **MANUFACTURED FOOD SERVICE EQUIPMENT SCHEDULE****A. PASS-THRU REFRIGERATOR****Item No. 5.**

1. Model No. RHT 2-32 WPUT-HG as manufactured by TRAUlsen & CO., INC.
2. Size: Approximately 58" long x 38" wide x 83" high.
3. Finish: Stainless Steel.
4. Power: 115 volt, 60 cycle, single phase.
5. Options and Accessories:
 - a. Hinged Glass Doors.
 - b. Fluorescent Lights.
 - c. Six inch (6") Stainless Steel Legs.
 - d. Adjustable Stainless steel shelves (five (5) shelves per unit).
 - e. Condensate Drain Extension.

B. PASS-THRU REFRIGERATOR**Item No. 6.**

1. Model NO. RHT 2-32 WPUT-HG as manufactured by TRAUlsen & CO., INC.
2. Size: Approximately 58" long x 38" wide x 83" high.
3. Finish: Stainless Steel
4. Power: 115 volt, 60 cycle, single phase.
5. Options and Accessories:
 - a. Hinged Glass Doors
 - b. Fluorescent Lights.
 - c. Six inch (6") Stainless steel Legs.
 - d. Adjustable Stainless Steel shelved (five (5) shelves per unit).
 - e. Condensate Drain Extension.

C. PASS-THRU HEATED CABINET**Item No. 7.**

1. Model No. RHF 2-32 WP-HG as manufactured by TRAUlsen & CO., INC.
2. Size: Approximately 58" long x 38" wide x 83" high.
3. Finish: Stainless Steel
4. Power: 208/115 volt, 60 cycle, single phase.
5. Options and Accessories:
 - a. Hinged Glass Doors
 - b. Fluorescent Lights.
 - c. Six inch (6") Stainless steel Legs.
 - d. Adjustable Stainless Steel shelved (five (5) shelves per unit).

D. WORK TABLE**Item No. 9**

1. Model No. VSS-3612 as manufactured by ADVANCE TABCO.
2. Size Approximately 144" long x 35" wide x 34" high.
 - a. With undershelf.
3. Finish: Stainless Steel.

E. FRYER WITH FILTER**Item No. 10.**

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1. Model No. 14 as manufactured by PITCO FRIALATOR, INC.
2. Size: Three (3) Fryer sections and one (1) Filter section, Approximately 49" x 34" wide x 34" high.
3. Finish: Stainless Steel cabinet and tanks.
4. Power: 120 volt, 60 cycle, single phase, 110 MBTU natural gas.
5. Options and Accessories:
 - a. Fryers;
 - 1) Stainless Steel Cabinet.
 - 2) Stainless Steel Tank.
 - 3) Basket Lift.
 - 4) Digital Solid State Thermostat with Melt Cycle.
 - 5) Drain Valve Interlock.
 - 6) Covers.
 - 7) Fryer Cleaner.
 - b. Filter;
 - 1) Flush Hose.
 - 2) Filter powder packets.
 - 3) Filter paper.
 - 4) Food warmer.

F. RANGE, COMBINATION OPEN BURNER WITH FRYTOP**Item No. 11.**

1. Model No. CHSSR-6-29-FTR24 with Hi-shelf, Intermediate Storage Shelf, and Storage Door as manufactured by the WOLF RANGE COMPANY.
2. Size: 68" long x 33" wide x 37" high cooking surface, and 58" high shelf, with six (6) Open Top Burners and 34" long Fry-Top.
3. Finish: Stainless steel.
4. Utilities: 276 mbtu natural gas.
5. Options and Accessories:
 - a. 29" Oven.
 - b. Intermediate Storage Shelf.
 - c. Storage Door.
 - d. Stainless Steel Hi-Shelf.

G. OVEN, DOUBLE CONVECTION**Item No. 12.**

1. Model No. 2-115 as manufactured by THE MONTAGUE COMPANY.
2. Size: Two (2) sections approximately 38" long x 39" wide x 79" high.
3. Finish: Stainless Steel.
4. Utilities: 110 volt, 60 cycle, single phase, 230 mbtu natural gas
5. Options and Accessories:
 - a. Porcelainized Steel Interior.
 - b. Stainless Steel (S/S) Left and Right Sides, Top and Back.
 - c. Six inch (6") NSF Legs.
 - d. Five (5) racks per Oven section.

H. KETTLE, TILTING, STEAM JACKETED**Item No. 13.**

1. Model No. DHT60 as manufactured by GROEN.
2. Size: 60 Gallon capacity, approximately 48" long x 41" wide x 46" high.
3. Finish: Stainless Steel.
4. Utilities: 150 mbtu natural gas.
5. Options and Accessories:
 - a. 1 1/2" Tangent draw-off.
 - b. No. 51 Counterbalanced hinged cover.

I. WORK TABLE WITH POT RACK, UTENSIL RACK AND SHELF**Item No. 16.**

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1. Model No. VSS-3612 with SCT - 144, Mid-Mount Pot Rack, Utensil Rack and Shelf, as manufactured by ADVANCE TABCO.
2. Size: Approximately 144" long x 36" wide x 34" high Table (84" high Uppershelf).
 - a. With Undershelf, Pot Rack, Utensil Rack and Uppershelf.
3. Finish: Stainless Steel.

J. BAKERS TABLE WITH POT RACK, UTENSIL RACK AND SHELF **Item No. 17.**

1. Model No. TBS-305 with Hardwood Top and SCT-60, Rear-Mount Pot Rack, Utensil Rack and Shelf, as manufactured by ADVANCE TABCO.
2. Size: Approximately 60" long x 30" wide x 36" high Table (84" high Uppershelf).
 - a. With Pot Rack, Utensil Rack, Uppershelf, and hardwood Top with coved Hardwood Risers.
3. Finish: Stainless Steel and Hardwood.

K. INGREDIENT BIN (PLASTIC INGREDIENT BIN) **Item No. 17A.**

1. Model No. 209 as manufactured by the DUKE MANUFACTURING CO.
2. Size: 3.4 Cubic Foot capacity, approximately 18" long x 24" wide x 26" high.
3. Finish: Plastic covered Stainless Steel.

L. MIXER **Item No. 18.**

1. Model No. H-600 as manufactured by HOBART.
 - a. With standard Timer and (Wire) Mixer Bowl Guard
2. Size: 60 Quart capacity, approximately 36" long x 36" wide x 60" high.
3. Utilities: 208 volt, 60 cycle, three phase.
4. Finish: Epoxy Paint and Stainless Steel.
5. Options and Accessories:
 - a. Power Bowl Lift.
 - b. 60 Quart Stainless Steel Bowl.
 - c. 30 Quart Stainless Steel Bowl with Adapter Ring.
 - d. Bowl Truck.
 - e. Three (3) Agitators (one each B Flat Beater, ED Dough Arm, and 1 Wire Whip).

M. WORK COUNTER POT AND PAN SINK **Item No. 19.**

1. Model No. 94-83-60-36RL as manufactured by ADVANCE TABCO.
2. Size: 162" long x 35" wide x 34" high with three (3) 20" long x 28" wide x 14" deep sinks.
3. Finish: Stainless Steel Top Assembly, Sink Bowls, and Legs.
4. Utilities: Hot and Cold Water, Sanitary Sewer
5. Accessories: Weld in Cone and Install Waste Disposer Item No. 19A in Left-hand Drainboard.
6. Trim: Coordinate installation of three (3) Mixing Faucets, two Swing Nozzle and one Pre-Rinse, and Lever Waste Drain Outlets for three sinks.

N. DISPOSER **Item Nos. 19A and 27A.**

1. Model No. 1500 - 1 1/2 hp Commercial Food Waste Disposer as manufactured by BUSBOY by KENLIN, INC.
 - a. Install in Item Nos. 19 and 27 respectively.
2. Finish: Stainless steel and chrome plated, paint free.
3. Utilities: 208 volt, 60 cycle, three phase.
4. Options and Accessories:
 - a. Model No. B13038 Mounting Assembly with Stainless Steel Cone and Water Swirl Elbow, 15" diameter x 8 3/8" deep, weld in Item Nos. 19 and 27 respectively.
 - b. Model No. B25101 Automatic Reversing Control Panel.

O. POT AND PAN SINK WASHING UNIT **Item No. 19B.**

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1. Model No. PW-106 "Hydro-Surge" Washing Unit as manufactured by WELLS MANUFACTURING COMPANY.
 - a. Install in Item No.19 in Left-hand sink.
2. Finish: Stainless steel cover.
3. Power: 120 volt, 5.6 amps, 1/3 HP, 60 hz, single phase.

P. WALL SHELF**Item Nos. 20, 25 and 28.**

1. Model No. 33PDS as manufactured by METRO (The INTERMETRO INDUSTRIES CORPORATION).
2. Size: Varying lengths, 14" wide shelves, complete with Posts and Brackets, and End and Mid Unit Shelf Supports.
 - a. As shown on the drawings, and in accordance with the General Requirements.

Q. RANGE, COMBINATION OPEN BURNER WITH FRYTOP**Item No. 21.**

1. Model No. CHSSR-4-29-FTR22 with Hi-shelf, Intermediate Storage Shelf, and Storage Door as manufactured by the WOLF RANGE COMPANY.
2. Size: 45" long x 33" wide x 37" high cooking surface, and 58" high shelf, with four (4) Open Top Burners and 22" long Fry-Top.
3. Finish: Stainless Steel.
4. Utilities: 184 mbtu natural gas.
5. Options and Accessories:
 - a. 29" Oven.
 - b. Intermediate Storage Shelf
 - c. Storage Door.
 - d. Stainless Steel Hi-Shelf.

R. REACH-IN DUAL TEMP REFRIGERATOR, REFRIGERATOR/FREEZER**Item No. 26.**

1. Model No. RDT 2-32 WUT as manufactured by TRAUlsen & CO., INC.
2. Size: Approximately 58" long x 35" wide x 83" high.
3. Finish: Stainless Steel
4. Power: 115 volt, 60 cycle, single phase.
5. Options and Accessories:
 - a. Fluorescent Lights.
 - b. Six inch (6") Stainless Steel Legs.
 - c. Adjustable Stainless Steel shelves (five (5) shelves per section).
 - d. Condensate Drain Extension.

S. DISH DISPENSER, DROP-IN**Item No. 33A.**

1. Model No. AT-7 as manufactured by SERVOLIFT EASTERN Corporation.
2. Size: Approximately 13" diameter x 31" high.
 - a. For 9 3/8" to 10 1/4" dish diameter, and 28 to 36 bowls or 50 to 72 dishes.
3. Finish: Stainless Steel.
4. Options and Accessories:
 - a. Stainless steel outer Sleeve.
 - b. Stainless Steel Dispenser Cover

T. REFRIGERATOR, UNDERCOUNTER**Item No. 34.**

1. Model No. 249RP as manufactured by SUB-ZERO.
2. Size: 4.9 Cubic Foot capacity, approximately 24" long x 24" wide x 34" high.
3. Finish: Plastic Laminate Door
4. Power: 115 volt, 60 cycle, single phase.
5. Options and Accessories:
 - a. Plastic Laminate Door to match Laminate-Clad Wood Cabinets.
 - b. Door kit to change door swing.

U. SALAD BAR**Item No. 35.**

1. Model No. Aerohot AHC-5M as manufactured by the DUKE MANUFACTURING CO.
2. Size: Approximately 72" long x 24" wide x 34" high serving surface, and 54" high canopy.
3. Finish: Plastic Laminate.
4. Power: 120 volt, 60 cycle, single phase.
5. Options and Accessories:
 - a. 3 Bar Tray Slide.
 - b. Plastic Laminate Body Finish.

V. WALK-IN COOLER/FREEZER**Item No. 37.**

1. Description:
 - a. Pre-fabricated, sectional, walk-in Cooler/Freezer box as shown on the Drawings and as manufactured by KOLPAK MANUFACTURING CO.
 - b. Walls, ceiling and recessed floor shall consist of pre-fabricated metal panels separated by foamed-in-place urethane insulation.
2. Size: 29'- 9 1/2" long x 12'- 6 1/2" wide x 8' - 6" high.
 - a. Provide with interior partition forming two compartment as shown on Drawings.
3. Standards:
 - a. Construction shall comply with National Sanitation Foundation and Factory Mutual System standards.
4. Panels:
 - a. Panels shall consists of interior and exterior panels separated by foamed-in-place urethane insulation a minimum of 4" thick.
 - b. Panels 4" thick shall have a U factor of 0.0300 or less.
 - c. Foam core of panels shall be certified by Underwriters' Laboratory to have a flame spread of 25 or lower and smoke generation of 450 or lower when tested in accordance with UL standard 723.
 - d. Panel edges shall have foamed-in-place tongues and grooves with flexible vinyl edge gaskets and interlock by means of cam action locking devices.
5. Finish:
 - a. Exposed exterior shall be 22 gage stainless steel, unexposed exterior 24 gage galvanized steel or 26 gage galvalume.
 - b. Interior shall be 0.038 "stucco-embossed" aluminum.
 - c. Floor shall be 14 gage galvanized steel.
6. Doors:
 - a. Two (2) hinged flush fitting 34" x 78" of same material and requirements as panel sections.
 - b. Doors to have continuous magnetic vinyl gasket all around and anti-sweat perimeter heater.
 - c. Hardware:
 - 1) Chrome-plated brass.
 - 2) Each door to have two (2) self-closing, self-rising, cab-lift hinges.
 - 3) Door latch to be designed to easily open door by breaking the magnetic force of the door gasket.
 - 4) Latch to have cylinder-type lock with an inside safety release handle.
 - 5) Provide manufacture's standard exterior padlock hasp and staples for doors of Freezers and Coolers.
7. Lights:
 - a. Provide wall mounted and ceiling mounted vapor-proof incandescent lighting fixtures as shown on the Drawings.
 - b. Wall fixtures and exterior switches and pilot lights outside each door shall have concealed conduit to junction box above ceiling panels.
 - c. Electrical contractor to wire ceiling fixtures to switch.
8. Accessories:

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- a. Provide exterior reading dial thermometer for each box.
- b. Provide heated vent for Freezer.
- c. Ceiling Support's:
 - 1) Provide structural steel of sufficient strength to support ceiling panels and wall panels where necessary.
- d. Trim:
 - 1) Provide stainless steel trim as required where walk-in box meets building surfaces.

W. REFRIGERATOR SYSTEMS**Item Nos. 37A thru 37D.**

- 1. Description:
 - a. Refrigeration systems as manufactured by KOLPAK MANUFACTURING CO.
 - b. Systems shall be completely designed, furnished and installed within the scope of this Section.
 - c. Systems shall be the standard products and compatible with the Walk-In Cooler/Freezer product specified.
- 2. Criteria:
 - a. Systems shall be the standard products and compatible with the Walk-In Cooler/Freezer product specified.
 - b. Submittal shall show all load-producing criteria in order to maintain 35 degree F. temperature in the Cooler and 0 degree F. in the freezer, using 100 degree F. ambient temperature, and shall include a complete listing of all components along with manufacturer's catalog cuts paralleling design calculations.
- 3. Components:
 - a. Provide all components required to operate the systems including, but not necessarily limited to, the following:
 - 1) Provide all components required to operate the systems including, but not necessarily limited to, the following:
 - 2) Sight glass in liquid line at each condensing unit.
 - 3) Shut-off valves, expansion valves.
 - 4) Type "L" copper refrigerant piping, fully insulated with weatherproofing above roof.
 - 5) Full refrigerant charge.
 - 6) Hangers, straps, and clamps, insulated as required.
 - 7) Blower coils with all necessary controls, switches and accessories.
 - 8) Full temperature control system, including conduit and wiring.
 - 9) Condensate collection and piping to floor sink.
 - 10) Refrigerant suction lines are to be insulated with 3/4" elastomeric closed cell pipe insulation.

X. ICE CUBER AND BIN**Item No. 41.**

- 1. Model No. CME1402AS-32A Cuber with Model No. BH900S Bin as manufactured by SCOTSMAN.
- 2. Size: Approximately 48" long x 34" wide x 44" high bin, and 48" long x 24" wide x 28" high cuber, 72" high overall.
- 3. Finish: Stainless Steel.
- 4. Utilities: 208 volt, 60 cycle, single phase, Cold Water and Sanitary Sewer.

Y. FOOD WARMER**Item No. 46.**

- 1. Model No. RW-2 as manufactured by WELLS.
- 2. Size: Approximately 29" long x 21" wide x 27" high.
- 3. Finish: Stainless Steel.
- 4. Power: 120 volt, 60 cycle, single phase.
- 5. Options and Accessories:
 - a. 6" Stainless Steel Legs.

END OF SECTION

SECTION 22 00 00 – GENERAL PLUMBING PROVISIONS
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section covers and applies to all work included in Divisions 22.
- B. Work in this Section includes providing labor, materials, equipment, services necessary, fabrication, installation and testing for fully operational and safe systems including all necessary materials, appurtenances and features whether specified or shown in the contract documents or not, in conformity with all applicable codes and authorities having jurisdiction for the following:
 - 1. Plumbing work covered by all sections within Division 22 of the specifications, including, but not limited to:
 - a. Plumbing systems and equipment.

1.3 CODES AND REGULATIONS

- A. All work and materials shall be in accordance with current rules and regulations of applicable codes. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes. Should the Drawings or Specifications call for material or methods of construction of a higher quality or standard than required by these codes, the Drawings and Specifications shall govern. Applicable codes and regulations include, but are not necessarily limited to, the following:

California Building Code	CCR Title 24, Part 2
California Electrical Code	CCR Title 24, Part 3
California Mechanical Code	CCR Title 24, Part 4
California Plumbing Code	CCR Title 24, Part 5
California Energy Code	CCR Title 24, Part 6
California Fire Code	CCR Title 24, Part 9

1.4 DEFINITIONS

- A. Provide: The term "provide" as used in these specifications or on the drawings shall mean furnish and install.

- B. Piping: The term "piping" as used in these specifications or on the drawings shall mean all pipe, fittings, valves, hangers, insulation, etc. as may be required for a complete and functional system.
- C. Ductwork: The terms "duct" or "ductwork" as used in these specifications or on the drawings shall mean all ducts, fittings, joints, dampers, hangers, insulation, etc. as may be required for a complete and functional system.
- D. Wiring: The term "wiring" as used in these specifications or on the drawings shall mean all wiring, conduit, boxes, connections, transformers, relays, switches etc. as may be required for a complete and functional system.

1.5 PERMITS AND FEES

- A. The Contractor shall take out all permits and arrange for all tests in connection with his work as required. All charges are to be included in the work.

1.6 COORDINATION OF WORK

- A. Examination: Before starting work, thoroughly examine existing and newly completed underlying and adjoining work and conditions on which the installation of this work depends. Report to the Engineer in writing all conditions which might adversely affect this work.
- B. Layout: Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. Some work may be shown offset for clarity. The actual locations of all materials, piping, ductwork, fixtures, equipment, supports, etc. shall be carefully planned prior to installation of any work in order to avoid all interference with each other, or with structural, electrical, architectural or other elements.
- C. Verification: If discrepancies are discovered between drawing and specification requirements, the more stringent requirement shall apply. All conflicts shall be called to the attention of the Engineer prior to the installation of any work or the ordering of any equipment. No work shall be prefabricated or installed prior to this coordination. No costs will be allowed to the Contractor for any prefabrication or installation performed prior to this coordination. Verify the proper voltage and phase of all equipment with the electrical plans.
- D. Location of Utilities Prior to Trenching or Earthwork: The Contractor shall notify the Owner a minimum of two business days prior to beginning trenching or earthwork. Prior to this notification, the Contractor shall have marked all proposed trenches with paint and shall have contacted a utility locating company and have had this company mark all found underground utilities with paint. The Contractor shall then coordinate and arrange for a site visit with the Owner to review the proposed trenching and/or earthwork areas. Trenching and/or earthwork shall not begin until the Owner agrees. Repair and/or compensation for repair of marked utilities is the responsibility of the Contractor. The Owner retains the right to either self-perform the repair or require the Contractor to

complete the repair, as directed by the Owner. If while performing the work, the Contractor discovers utilities that have not been marked, the Contractor shall immediately notify the Owner verbally and in writing.

1.7 GUARANTEE

- A. Guarantee shall be in accordance with the General Conditions. The Contractor shall repair any defects due to faulty materials or workmanship and pay for any resulting damage to other work which appears within the guarantee period. These Specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the certificate of guarantee shall be furnished to the Owner through the Engineer.

1.8 QUIETNESS

- A. Piping, ductwork and equipment shall be arranged and supported so that vibration is a minimum and is not transmitted to the structure.

1.9 DAMAGES BY LEAKS

- A. The Contractor shall be responsible for damages caused by leaks in the temporary or permanent piping systems prior to completion of work and during the period of the guarantee, and for damages caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

1.10 EXAMINATION OF SITE

- A. The Contractor shall examine the site, compare it with Plans and Specifications, and shall have satisfied himself as to the conditions under which the work is to be performed. No allowance shall subsequently be made in his behalf for any extra expense to which he may be put due to failure or neglect on his part to make such an examination.

1.11 COMPATIBILITY WITH EXISTING SYSTEMS

- A. Any work which is done as an addition, expansion or remodel of an existing system shall be compatible with that system.

1.12 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be new unless otherwise noted. Materials and equipment of a given type shall be by the same manufacturer. Materials and equipment shall be free of dents, scratches, marks, shipping tags and all defacing features at time of project

acceptance. Materials and equipment shall be covered or otherwise protected during construction as required to maintain the material and equipment in new factory condition until project acceptance.

1.13 SUBMITTALS

- A. Shop Drawings: Within 30 days of contract award, the Contractor shall submit six copies of shop drawings for all materials, equipment, etc. proposed for use on this project. Material or equipment shall not be ordered or installed until written review is processed by the Engineer.
- B. Building information modeling (BIM):
 - 1. BIM process shall be performed at an LOD-400 level as part of developing the shop drawing and includes but is not limited to creating model of 3D objects in Revit or AutoCAD based program, modeling objects accurately based on actual cut lengths and with access and clearance requirements incorporated, and coordinating with all MEP trades.
 - 2. Deliverables to engineer: Detail, 1/4 inch equals 1 foot scale drawings.
- C. All shop drawings must comply with the following:
 - 1. Shop drawings are required for all material and equipment items and shall include manufacturer's name and catalog numbers, dimensions, capacities, performance curves, and all other characteristics and accessories as listed in the specifications or on the drawings. Descriptive literature shall be current factory brochures and submittal sheets. Capacities shall be certified by the factory. FAX submittals are not acceptable.
 - 2. All shop drawings shall be submitted at one time in a neat and orderly fashion in a suitable binder with title sheet including Project, Engineer and Contractor, table of contents, and indexed tabs dividing each group of materials or item of equipment. All items shall be identified by the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on drawings.
 - 3. All capacities, characteristics, and accessories called for in the specifications or on the drawings shall be high-lighted, circled or underlined on the shop drawings. Calculations and other detailed data indicating how the item was selected shall be included for items that are not scheduled. Data must be complete enough to permit detailed comparison of every significant characteristic which is specified, scheduled or detailed.
- D. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and features desired. Proposed substitutions shall comply with the Owner's General Requirements. Calculations and other detailed data indicating how the item was selected shall be included. The Contractor shall assume full responsibility that substituted items or procedures will meet the specifications and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items. At the Engineer's request, furnish locations where equipment similar to the substituted equipment is installed and operating along with the user's phone numbers

and contact person. Satisfactory operation and service history will be considered in the acceptance or rejection of the proposed substitution.

- E. Review: Submittals will be reviewed for general conformance with the design concept, but this review does not guarantee quantity shown, nor does it supersede the responsibility of the Contractor to provide all materials, equipment and installation in accordance with the drawings and specifications. The Contractor shall agree that shop drawing submittals processed by the Engineer are not Change Orders; that the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. The Contractor shall agree that if deviations, discrepancies or conflicts between shop drawings and design drawings and specifications are discovered either prior to or after shop drawing submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed. If a resubmittal is required, submit a complete copy of the Engineer's review letter requiring such with the resubmittal.

1.14 MANUFACTURER'S RECOMMENDATIONS

- A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site through the construction of the project.

1.15 SCHEDULING OF WORK

- A. All work shall be scheduled subject to the review of the Engineer and the Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work contracted for as rapidly as possible consistent with good work, and shall cause no delay to other Contractors engaged upon this project or to the Owner. HVAC equipment and functions, whether existing or new, shall be maintained in operating condition whenever the facility is occupied, unless otherwise approved by the Owner.

1.16 DEMOLITION

- A. Existing equipment, ducts, piping, etc. noted for removal shall be removed and delivered to the Owner at a location to be determined by the Owner. Those items determined by the Owner to be of no value shall become the property of the Contractor and shall be removed from the job site by the Contractor at the Contractor's expense. Existing piping, ducts, services, etc. requiring capping shall be capped below floors, behind walls, above ceilings or above roof unless otherwise noted. Where items are removed, patch the surfaces to

match the existing surfaces.

1.17 HAZARDOUS MATERIAL REMOVAL

- A. All hazardous material removal will be by the Owner. Hazardous material is to be removed before the work is started. If the Contractor discovers hazardous material which has not been removed, the Contractor shall immediately cease work in that area and promptly notify the Owner.

1.18 OPENINGS, CUTTING AND PATCHING

- A. The locations and dimensions for openings through walls, floors, ceilings, foundations, footings, etc. required to accomplish the work under this Specification Division shall be provided under this Division. Except as noted below, the actual openings and the required cutting and patching shall be provided by other Divisions. Coring through existing concrete or masonry walls, floors, ceilings, foundations, footings, etc., and saw cutting of concrete floors or asphaltic concrete required to accomplish the work under this Specification Division shall be provided under this Division. Patching of these surfaces shall be provided by other Divisions. Cutting or coring shall not impair the strength of the structure. Any damage resulting from this work shall be repaired at the Contractor's expense to the satisfaction of the Engineer.

1.19 EXCAVATION AND BACKFILL

- A. General: Barrel of pipe shall have uniform support on sand bed. Sand shall be free from clay or organic material, suitable for the purpose intended and shall be of such size that 90 percent to 100 percent will pass a No. 4 sieve and not more than 5 percent will pass a No. 200 sieve. Unless otherwise noted, minimum earth cover above top of pipe or tubing outside building walls shall be 24", not including base and paving in paved areas.
- B. Excavation: Width of trench at top of pipe shall be minimum of 16", plus the outside diameter of the pipe. Provide all shoring required by site conditions. Where over excavation occurs, provide compacted sand backfill to pipe bottom. Where groundwater is encountered, remove to keep excavation dry, using well points and pumps as required.
- C. Backfill:
 - 1. 6" Below, Around, and to 12" Above Pipe: Material shall be sand. Place carefully around and on top of pipe, taking care not to disturb piping, consolidate with vibrator.
 - 2. One Foot Above Pipe to Grade: Material shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.

- D. Compaction: Compact to density of 95% within building and under walkways, driveways, traffic areas, paved areas, etc. and to 90% elsewhere. Demonstrate proper compaction by testing at top, bottom and one-half of the trench depth. Perform these tests at three locations per 100' of trench.

1.20 CONTINUITY OF SERVICES

- A. Existing services and systems shall be maintained except for short intervals when connections are made. The Contractor shall be responsible for interruptions of services and shall repair damage done to any existing service caused by the work. If utilities not indicated on the drawings are uncovered during excavation, the Contractor shall notify the Engineer immediately.

1.21 PROTECTIVE COATING FOR UNDERGROUND PIPING

- A. All ferrous pipe below grade (except cast iron) shall have a factory applied protective coating of extruded high density polyethylene, 35 to 70 mils total thickness, X-Tru-Coat, Scotchkote. All fittings and areas of damaged coating shall be covered with two layer double wrap of 10 mil polyvinyl tape to total thickness of 40 mils. John-Mansville. Protective coating shall be extended 6" above surrounding grade.
- B. All cast iron pipe shall have field applied tubular polyethylene encasement (polywrap) conforming to ANSI/AWWA C105/A21.5. All joints and transitions to have 2 layers of polywrap with ends sealed with adhesive tape or plastic tie straps around the poly wrap at 2'-0" intervals. Vertical risers to be wrapped thru vapor barrier. Wet seal joint water tight.

1.22 ACCESS DOORS

- A. Provide access doors as required where equipment, piping, valves, ductwork, etc. are not otherwise accessible. Access doors shall match the wall or ceiling finish and fire rating as indicated on the Architectural drawings. 16-gage steel frame and 14-gage steel door with paintable finish, except in ceramic tile, where door shall be 16-gage stainless steel with satin finish. Continuous hinge. Deliver doors to the General Contractor for installation. Milcor. Unless otherwise noted, the minimum sizes shall be as follows:

1 valve up to 1-1/2"	12" x 12"
1 valve up to 3"	16" x 16"

1.23 CONCRETE ANCHORS

- A. Steel stud with expansion wedge requiring a drilled hole – powder driven anchors are not acceptable. Minimum spacing shall be 12 diameters center to center and 10 diameters center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80% of the ICC Evaluation Service Report (ESR) values. Minimum concrete embedment shall be the nominal embedment listed in the ESR table. Hilti Kwik Bolt TZ.

1.24 EQUIPMENT ANCHORING AND OTHER SUPPORTS

- A. Mechanical systems (equipment, ductwork, piping, conduit, etc.) shall be anchored in accordance with the CBC. All systems mounted on concrete shall be secured with a concrete anchor at each mounting point. All air handlers shall be mounted on spring isolators. Secure base plate as indicated above. Attachment of equipment, ductwork, piping, conduit, etc. supported on curbs or platforms shall be made to the side of curbs and platforms, where possible. Where screws or lag bolts must be installed through the top of a sheet metal cap, the installation shall be as follows. Pre-drill pilot hole. Fill pilot hole with polyurethane sealant. Install screw or lag bolt with a flat washer and an EPDM washer adjacent to the sheet metal.

1.25 SUPPORTS AND SEISMIC RESTRAINTS

- A. Any structural element required to hang or support piping, ducts or equipment provided under this Division and not shown on other drawings shall be provided under this Division.
- B. Mechanical systems (equipment, ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance with the CBC. Submit anchorage calculations and details stamped and signed by a structural engineer registered in the State of California. Submit shop drawings showing location, type and detail of restraints. Submit manufacturer's data for restraints. Restraint system shall be Mason West, Inc. (OSHDPD OPM 0043-13).

1.26 PAINTING

- A. Paint all black iron supports, hangers, anchors, etc. with two coats of rust resisting primer. Also paint all uninsulated black iron piping exposed to weather with two coats of rust resisting primer.

1.27 ROOF PENETRATIONS AND PATCHING

- A. Whenever any part of the mechanical systems penetrates the roof or exterior wall, the openings shall be flashed and counter-flashed water tight with minimum 22 gauge galvanized sheet metal. Flashing shall extend not less than eight inches from the duct, pipe, or supporting member in all directions unless detailed otherwise. All roof penetrations and patching shall be in accordance with the recommendations of the National Roofing Contractor's Association and the Owner's roofing standards.

1.28 SYSTEM IDENTIFICATION

- A. Above Grade Piping: Provide markers on piping which is either exposed or concealed in accessible spaces. For piping systems, other than drain and vent lines, indicate the fluid conveyed or its abbreviation, either by pre-printed markers or stenciled marking, and include arrows to show direction of flow. Pre-printed markers shall be the type that wrap

completely around the pipe, requiring no other means of fastening such as tape, adhesive, etc. Comply with ANSI A13.1 for colors. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portions of lines. Marking of short branches and repetitive branches for equipment connections is not required.

- B. Below Grade Piping: Bury a continuous, pre-printed, bright-colored, metallic ribbon marker capable of being located with a metal detector with each underground pipe. Locate directly over buried pipe, 6" to 8" below finished grade.
- C. Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-4). Provide 1/2" high lettering - white on black background. Nameplates shall be permanently secured to the exterior of the unit.
- D. Valves: Provide brass valve tags with brass hooks or chains on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops and shut-off valves at fixtures and other repetitive terminal units. Prepare and submit a tagged-valve schedule, listing each valve by tag number, location and piping service. Deliver to Owner through the Engineer.

1.29 CLEANING

- A. Progressively and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work. This includes but is not limited to building surfaces, piping, equipment and ductwork, inside and out. Surfaces shall be free of dirt, grease, labels, tags, tape, rust, and all foreign material.

1.30 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Printed: Three copies of Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts list for all faucets, trim, valves, etc. shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. AC-3). All Wiring Diagrams shall agree with reviewed Shop Drawings and indicate the exact field installation. All instructions shall be submitted at the same time and shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. Pumps, Fans, Motors, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included.
- B. Verbal: The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The controls contractor shall present that portion of the instructions that apply to the control system. The Engineer's office shall be notified 48 hours prior to this meeting.
- C. Acknowledgment: The Contractor shall prepare a letter indicating that all operation and

maintenance instructions (printed and verbal) have been given to the Owner, to the Owner's satisfaction. This letter shall be acknowledged (signed) by the Owner and submitted to the Engineer.

1.31 RECORD DRAWINGS

- A. The Contractor shall obtain one set of prints for the project, upon which a record of all construction changes shall be made. As the work progresses, the Contractor shall maintain a record of all deviations in the work from that indicated on the drawings. Final location of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, i.e. building, curbs, walks. In addition, the water, gas, sewer, under floor duct, etc. within the building shall be recorded by offset distances from building walls. An electronic copy of the original drawings will be made available to the Contractor. The Contractor shall transfer the changes, notations, etc. from the marked-up prints to the electronic copy. The record drawings (marked-up prints, electronic drawings disc and a hard copy) shall be submitted to the Engineer for review.

1.32 ACCEPTANCE TESTING

- A. The Contractor shall perform, document and submit all acceptance testing as required by California Code of Regulations, Title 24, Part 6.

END OF SECTION

SECTION 22 00 50 – PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL MECHANICAL PROVISIONS

- A. The preceding General Mechanical Provisions shall form a part of this Division with the same force and effect as though repeated here.

1.3 SCOPE

- A. Included: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:
 - 1. Sanitary sewer system.
 - 2. Domestic water system.
 - 3. Fuel gas system.
 - 4. Drain system (including condensate drain).
 - 5. All equipment as shown or noted on the drawings or as specified.
 - 6. Demolition as indicated on drawings. Where demolition is called for, remove all equipment, piping, braces, housekeeping pads, supports and related items no longer required.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Sanitary Sewer:
 - 1. Soil, Waste and Vent Piping: Inside Building and Within Five Feet of Building Walls: Standard weight coated cast iron pipe and fittings, CISPI 301, or hub end with rubber gaskets, ASTM A74, ASTM C564. All cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute as manufactured by Tyler, AB&I or Charlotte. Heavy-duty shielded couplings, Type 304 stainless steel, with neoprene gasket, ASTM C1540. Husky HD 2000, Clamp-All 80. Mission HeavyWeight MG Couplings are also acceptable. Size 2" and smaller above grade may be standard weight galvanized steel, ASTM

A120/A53, with coated cast iron recessed drainage fittings, ANSI B16.12. 2" and smaller exposed to view shall be galvanized steel, ASTM A120/A53, with coated cast iron recessed drainage fittings, ANSI B16.12.

All cast iron pipe shall have field applied tubular polyethylene encasement (polywrap) conforming to ANSI/AWWA C105/A21.5. All joints and transitions to have 2 layers of polywrap with ends sealed with adhesive tape or plastic tie straps around the poly wrap at 2'-0" intervals. Vertical risers to be wrapped thru vapor barrier. Wet seal joint watertight.

2. Cleanouts: Comparable models of Josam, Wade or Zurn are acceptable. Floor Cleanouts: Smith 4028 with nickel bronze top in finished areas; Smith 4228 in utility areas. Wall Cleanouts: Smith 4532 with stainless steel cover and screw. Pipe Cleanouts: Iron body with threaded brass plug.
3. Cleanout Box: Precast reinforced concrete. Cast iron lid marked for service. Christy F22 in foot traffic areas; G5 in roadways.

B. Water and Gas:

1. Cold Water Piping:

a. Inside Building, Within Five Feet of Building Walls, and All Above Grade:

- 1) Hard temper seamless copper, ASTM B88. Wrought copper fittings, ANSI B16.22. Type L with brazed joints (1100F, min.). 1-1/2" and smaller above grade may be soldered, 95-5 tin-antimony solder. All nipples shall be red brass (85% copper). Above grade fittings may be copper (1/2" to 2") or bronze (2-1/2" to 4") press fittings, ASME B16.18 or ASME B16.22. EPDM O-rings. Installation shall be in accordance with the manufacturer's installation instructions. Nibco, ProPress.

b. Outside Building - Below Grade:

- 1) Schedule 40 galvanized steel pipe, ASTM A120/A53. 150 psi galvanized malleable iron screwed fittings, ANSI B16.3. Galvanized steel shall have protective coating.

-or-

- 2) Same as Inside Building. Press fittings are not acceptable below grade.

-or-

- 3) 3" and Smaller: Schedule 40 Polyvinyl chloride (PVC) with solvent weld fittings where approved by administrative authority.

2. Hot Water Piping:

a. Inside Building - Above Slab: Same as Cold Water Piping - Inside

Building.

- b. Outside Building or Below slab: Pre-insulated. Type L copper core. 1" foamed polyurethane insulation. Polyvinyl chloride jacket. Sealed ends. Rubber ring internal slip joint. Fittings shall be wrought copper, with brazed joints (1100F, min.). Ricwil, Thermal Pipe Systems.

3. Gas Piping:

- a. Inside Building and All Above Grade: 2" and Smaller: Schedule 40 galvanized steel pipe, ASTM A120/A53. 150 psi galvanized malleable iron screwed fittings, ANSI B16.3, ANSI B31.8. Flexible connections shall be convoluted yellow brass with dielectric couplings, AGA approved. 2-1/2" and larger: Schedule 40 black steel pipe, ASTM A120/A53. Standard weight carbon steel welding fittings, long radius ells, ANSI B16.9.
- b. Inside Building - Below Grade to Five Feet Outside Building: Same as Inside Building and All Above Grade. Provide sleeves and vents acceptable to administrative authority.
- c. Outside Building - Below Grade: Polyethylene pipe and fittings, ASTM D2513. PolyPipe GDY 20, PE 2406/2708. Otherwise, piping shall be coated schedule 40 steel.

4. Valves and Specialties:

a. Valves:

- 1) General: Manufacturer's model numbers are listed to complete description. Equivalent models of Crane, Grinnell, Milwaukee, Nibco, Stockham or Walworth are acceptable. All valves of a particular type or for a particular service shall be by the same manufacturer. Butterfly valves may be substituted for 2-1/2" and larger gate valves above grade; see specification below. Use full port ball valve for 2" and smaller water shutoff valves; see specification below.
- 2) Gate Valve: 2" and Smaller: All bronze. Rising stem. Union bonnet. Wedge disk. Malleable iron handwheel. 200 psi WOG. Stockham B-105. 2-1/2" and Larger: Iron body, bronze mounted. Non-rising stem. Wedge disk. 200 psi WOG. Flanged or AWWA hub end as applicable. Stockham G-612. Underground valves shall have square operating nut. Provide one operating "T" handle for underground valves.
- 3) Butterfly Valve: Iron threaded lug body. Aluminum bronze disk. O-ring seals. Resilient, removable seat. 416 stainless steel shaft. 6" and smaller valves shall have multi-position lever handle. 8" and

larger valves shall have gear operator. Provide 2" extension neck at insulated pipes. Demco Series NE, Grinnell, Stockham

- 4) Check Valve: 2" and Smaller: All bronze swing check, regrinding. 200 psi WOG. Stockham B-319.
- 5) Ball Valve: Full port. Bronze body, cap, stem, disk and ball. Screwed connection. Lever handle. TFE seat. O-ring seals. 300 psi WOG. Apollo, Grinnell, Jomar.
- 6) Plug Valve: Valves in gas piping systems must be UL listed for gas distribution. 4" and Smaller: Eccentric bronze or nickel plated semi-steel plug. Semi-steel body. Bronze bushings. Buna-N-rings. 175 psi WOG. DeZurik Series 400. 1-1/2" and smaller natural gas valves may be full port ball valves. Apollo, Jomar, Grinnell.
- 7) Valve Box: Precast reinforced concrete. Cast iron lid marked for service. Christy G5 in roadways (use B-9 for ball valves).
- 8) Earthquake Valve: Valves must be UL listed for gas distribution and comply with ASCE 25. Cast-aluminum body with stainless-steel internal parts; horizontal orientation; nitrile-rubber, reset-stem o-ring seal; open-or-closet valve position indicator; composition valve seat with calpper held by spring or magnet locking mechanism; level indicator. 2" and Smaller: threaded connections. 2-1/2" and Larger: flanged connections. Pacific Seismic Products.

c. Miscellaneous Specialties:

- 1) Temperature and Pressure Relief Valve: ASME rated fully automatic, reseating combination temperature and pressure relief valve sized in accordance with energy input. Sensing element immersed within upper 6" of tank. Watts.
- 2) Union: 2" and Smaller: AAR malleable iron, bronze to iron ground seat. 300 psi. Grinnell. Size 2-1/2" and Larger: Grooved pipe, synthetic gasket, malleable iron housing. Victaulic Style 77, Type "E" gasket, Grinnell.
- 3) Dielectric Coupling: Insulating union or flange rated for 250 psig. EPCO.
- 4) Shock Absorber: Multiple bellows. Seamless copper chamber approved for concealed installations. Designed and applied in accordance with PDI WH201. Sioux Chief, Watts.
- 5) Flexible Connection: Corrugated bronze core covered with high tensile bronze tubular braid. 150 psi working pressure. 2" and

smaller shall have screwed connections. 2-1/2" and larger shall have flanged connections. Flexonics, Keflex.

- C. Drain Piping (including Condensate): Copper Type L with brazed joints as specified above for inside building cold water piping. No press fittings for drain piping.
- D. Miscellaneous Piping Items:
 - 1. Pipe Support:
 - a. Pipe Hanger: Steel "J" hanger with side bolt for piping 4" and smaller; steel clevis hanger for piping 5" and larger. Load and jam nuts. Size and maximum load per manufacturer's recommendation. Felt liner for copper piping. Hanger and rod shall have galvanized finish. B-Line, Grinnell, Unistrut.
 - b. Isolating Shield: Galvanized steel shell and reinforcing ribs. 1/4" non-conducting hair felt pad. Pipe hanger in accordance with paragraph above. Increase hanger size per manufacturer's recommendation. B-Line, Semco, Superstrut.
 - c. Construction Channel: 12-gage, 1-5/8" x 1-5/8" galvanized steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Grinnell, Unistrut.
 - 2. Flashing: Vent flashing shall be 4 lb/ft² lead, 16" sq. flange, length sufficient to be turned down 2" into vent. Oatey. Flashing for other piping through roof shall be prefabricated galvanized steel roof jacks with 16" sq. flange. Provide clamp-on storm collar and seal water tight with mastic. For cold process built-up roof, material shall be 4 lb/ft² lead instead of galvanized steel.

2.2 PIPING INSULATION MATERIALS

- A. General: All piping insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.
- B. Pre-Molded Fiberglass: Heavy density sectional pre-molded fiberglass with vapor barrier laminated all service jacket and pressure sealing vapor barrier lap. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft²-F at a mean temperature of 50F. Perm rating 0.02, ASTM E96. Puncture rating 50 Beach units, ASTM D781. Provide 3" (min.) wide tape of same material as lap for butt joints. For hot water piping, thickness shall be 1" for pipe sizes 3/4" and less; 1-1/2" thickness for pipe sizes 1" and larger. Certainteed, Knauf, Johns-Manville, Owens-Corning.
- C. Fiberglass Blanket: Unfaced. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft²-F at a mean temperature of 50F. 1-1/2" thickness. Knauf, Johns-Manville, Owens-Corning.

- D. PVC Jacket (for pipe, fittings and valves): Pre-molded polyvinyl chloride (PVC) jackets, 0.020" thickness. Size to match application. Provide solvent weld adhesive and PVC vapor barrier pressure sealing tape by same manufacturer. Zeston.
- E. Stretchable Glass Fabric: Reinforcing mesh. 10 X 20 continuous filament glass yarns per inch. Johns-Manville.
- F. Vapor Barrier Coating: Childers CP-30, Foster 30-25.
- G. Lagging Adhesive: Childers CP-50A, Foster 30-36.
- H. Outdoor Mastic: Childers CP-21, Foster 65-05.
- I. Insulating Tape: Ground virgin cork and synthetic elastomeric. Black, odorless, and non-toxic. K factor 0.43 Btu-in/hr-ft²-F or less. Non-shrinking. For outdoor use, provide protective finish by same manufacturer. Halstead.
- J. Molded Closed Cell Vinyl (Piping Insulation Under Disabled Accessible Lavatories and Sinks): Fully molded closed cell vinyl, 3/16" thick. Internal ribs on drain insulation to provide air gap. Thermal conductivity shall not exceed 1.17 BTU-in/hr-ft²-°F at an average temperature of 73°F. Weep hole in cleanout nut enclosure. Out of sight nylon fastening system. Hinged cap over valve to allow access for servicing. Truebro Lav-guard.

2.3 FIXTURES

- A. General: Provide rough-in for and install all plumbing fixtures shown on drawings. Except in equipment rooms, all trim, valves and piping not concealed in wall structure, above ceiling or below floors, shall be brass with polished chrome plate finish, unless noted otherwise. All enameled fixtures shall be acid resisting. Standard color is white unless otherwise noted.
- B. Schedule: Refer to Plumbing Fixture Schedule on the drawings for list of fixtures and trim. Manufacturer's model numbers are listed to complete description. Equivalent models of American Standard, Eljer, Elkay, Haws, Kohler or T&S Brass are acceptable. For drainage fixtures, equivalent models of Josam, Smith or Zurn are acceptable.
- C. Stops and P-Traps: All fixtures shall be provided with stops and P-Traps as applicable. Wall mounted faucets, valves, etc. shall have integral stops or wall mounted stops.
 - 1. Stops: All hot and cold water supplies shall be 1/2" I.P.S. inlet angle stops with stuffing box, loose key lock shield, and brass riser (3/8" for 2-1/2 gpm and less, otherwise 1/2"). McGuire, Speedway.
 - 2. P-Traps: Semi-cast brass, ground joint. 17-gage. Clean-out plug. Unobstructed waterway. California Tubular, McGuire.

2.4 EQUIPMENT

A. General Requirements:

1. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.
2. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.
3. Ratings:
 - a. Electrical: Electrical equipment shall be in accordance with NEMA standards and UL or ETL listed where applicable standards have been established.
 - b. Gas: Gas burning equipment shall be furnished with 100% safety gas shut-off, intermittent pilot ignition, and be approved by AGA.
4. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.
5. Electrical:
 - a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories and controls required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.
 - b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.
 - c. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.

- B. Water Heater: Electric. Glass lined tank with magnesium anode protection. 150 psi working pressure. Fully insulated. Automatic temperature control. High limit control. Provide

ASME rated temperature and pressure relief valve sized in accordance with energy input, dielectric couplings and drain cock. UL listed. A.O. Smith, American Appliance, State Industries.

- C. Water Heater: Electric. Tankless point-of-use instant hot water heater. Cast aluminum housing, celcon waterways and nichrome coils. Maximum 150 psi rating. UL listed. Chronomite, Eemax.
- D. Circulating Pump: In-line centrifugal. Aluminum housing. All parts exposed to fluid, stainless steel. Water lubricated ceramic shaft and bearings. Epoxy encapsulated windings. Grundfos, Bell and Gossett, Taco.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General:

1. Piping Layout: Piping shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by the Engineer. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed in a manner to ensure unrestricted flow, eliminate air pockets, prevent any unusual noise, and permit complete drainage of the system. All piping shall be installed to permit expansion and contraction without strain on piping or equipment. Vertical lines shall be installed to allow for building settlement without damage to piping. Pipe sizes indicated on the drawings are nominal sizes unless otherwise noted. Provide secondary drain piping where required.
2. Joints:
 - a. Threaded: Pipe shall be cut square and reamed to full size. Threads shall be in accordance with ANSI B2.1. Joint compound or tape suitable for conveyed fluid shall be applied to male thread only. Joints shall be made with three threads exposed.
 - b. Welded or Brazed: Filler rod shall be of suitable or the same alloy as pipe. Brazing filler metal shall have a minimum melting point of 1100F. Welding or brazing shall be performed by a Certified Welder or Brazer as certified by an organization/institution that uses standards recognized by the American Welding Society (AWS) and meets the requirements of the ASME Boiler and Pressure Vessels Code, Section 9.
 - c. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.

- d. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards.

3. Fittings and Valves:

- a. Standard Fittings: All joints and changes in direction shall be made with standard fittings. Close nipples shall not be used.
- b. Reducers: Pipe size reduction shall be made with bell reducer fittings. Bushings shall not be used.
- c. Unions: A union shall be installed on the leaving side of each valve, at all sides of automatic valves, at equipment connections, and elsewhere as necessary for assembly or disassembly of piping.
- d. Valves: All valves shall be full line size. Provide shut-off valve for each building and each equipment connection. Provide shut-off valve at each point of connection to existing piping. At equipment connections, valves shall be full size of upstream piping, except that gas valves within 18" of the point of connection to the equipment may be the same size as the equipment connection.
- e. Valve Accessibility: All valves shall be located so that they are easily accessible. Valves located above ceilings shall be installed within 24" of the ceiling. Refer to specification 200000 for access requirements.

4. Pipe Support:

- a. General: Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Side beam clamps shall be provided with retaining straps to secure the clamp to the opposite side of the beam. Vertical piping shall be supported with riser clamp at 20' on center (maximum). Support pipe within 12" of all changes in direction. Support individual pipes with pipe hanger. Copper piping systems which protrude through a surface for connection to a fixture stop or other outlet shall be secured with a drop ell, Grinnell No. 9788; nipple through surface shall be threaded brass.

1) Pressure Pipe:

<u>Pipe Size (Inches)</u>	<u>Copper</u>	<u>Maximum Spacing*</u> <u>Between Supports (ft.)</u>	
		<u>Sch. 40</u> <u>steel</u>	<u>Plastic</u>
1/2	6	6	4
3/4	6	8	4
1	6	8	4
1-1/4	6	10	4
1-1/2	6	10	4
2	10	10	4

2-1/2	10	10	4
3	10	10	4
4	10	10	4

*Based on straight lengths of pipe with couplings only. Provide additional supports for equipment, valves or other fittings. Plastic piping shall be supported per the manufacturer's recommendations. Seismic requirements may reduce maximum spacing.

- 2) Gravity Drain Pipe: Piping shall be supported at each length of pipe or fitting, but in no case at greater spacing than indicated above for pressure pipe.
 - b. Hot and Cold Water Piping: All hot and cold water piping shall have isolating shield; no portion of this piping shall touch the structure without an isolating shield except at anchor points for fixture rough-in.
 - c. Trapeze: Trapeze hangers of construction channel and pipe clamps may be used. Submit design to Engineer for review.
5. Miscellaneous:
- a. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings, or floors in finished areas.
 - b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" annular clearance between sleeve and pipe for piping 3" and smaller, otherwise 2" annular clearance. Piping through walls below grade shall be sealed with Link-Seal.
 - c. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe or pipe insulation sealed with fire rated materials in accordance with the requirements of the fire authority having jurisdiction.
 - d. Dielectric Couplings: Dielectric couplings shall be installed wherever piping of dissimilar metals are joined, except that bronze valves may be installed in ferrous piping without dielectric couplings.
 - e. Thermometer or Pressure Gage Tap: Provide tee for instrument well. Minimum size of pipe surrounding well shall be 1-1/2".
 - f. Exposed Pipe at Fixtures: Piping extending from finished surfaces into a finished room shall be chrome plated brass, except under kitchen sinks in commercial kitchens.

B. Sanitary Sewer Piping:

1. General: Where inverts are not indicated, sanitary sewer piping shall be installed at

- 1/4" per foot pitch. Piping 4" and larger may be installed at 1/8" per foot pitch where structural or other limitations prevent installation at a greater pitch. Bell and spigot piping shall be installed with barrel on sand bed; excavate hole for bell.
2. Cleanouts: Install cleanouts at ends of lines, at changes of direction greater than 45 degrees, and at not greater than 100 foot intervals. Locate interior cleanouts in accessible locations and bring flush to finished surface.
 3. Vents: Vents shall terminate not less than 6" above the roof nor less than 24" from any vertical surface nor within 10' of any outside air intake. Install horizontal vent lines at 1/4" per foot pitch. Offset vents 2' minimum from gutters, parapets, ridges and roof flashing.
- C. Water Piping: Connections to branches and risers shall be made from top of main. Supply header in fixture battery shall be full size to last fixture, reducing in size only on individual connections to each fixture in battery. Minimum pipe size shall be 3/4", unless otherwise noted. Exposed fixture stops and flush valves shall be installed with brass nipples for copper piping and galvanized nipples for galvanized piping. Nipples are to extend from outside of wall to fitting at header or drop behind finish wall surfaces. Pipe nipples shall be same size as stop or flush valve. Provide shut off for each building and each connection to equipment. Shock absorbers shall be installed in a vertical position per manufacturer's instructions and per PDI-WH 201 where flush valves, metering faucets or other fast acting valves are connected to the domestic piping system. Only equipment mounted on vibration isolators shall be connected with flexible connections. Underground hot water and cold water piping which run parallel to each other shall be installed a minimum of 3 feet apart.
- D. Gas Piping: Installation shall comply with CPC and NFPA 54 (National Fuel Gas Code). Shall be pitched to drain to dirt legs at low points. No unions shall be installed except at connections to equipment. Provide shutoff and dirt leg at each equipment connection. Only equipment mounted on vibration isolators shall be connected with flexible connectors. Under floor piping shall be sleeved and vented. Underground Polyethylene pipe and butt fusion fittings shall be joined in accordance with manufacturer's recommendations. Metal to plastic transition fittings shall be installed at all transitions. Provide 14-gage insulated tracer wire secured to pipe at 10' intervals with nylon ties. Terminate tracer 6" above grade at both ends.
- E. Drain Piping (Including Condensate): Install with constant pitch to receptacle, 1/4" per foot where possible, otherwise 1/8" per foot minimum. Provide TEE with clean-out plug at all changes of direction. Provide trap at each air handling unit to prevent air leakage. Only equipment mounted on vibration isolators shall be connected with flexible connection. Piping not concealed in wall structure, above ceilings or below floors shall be chrome plated brass.
- F. PVC Piping: Shall be cut square and assembled prior to solvent weld. Apply primer per manufacturer's recommendations. Coat male joint fully with solvent, make joint before solvent dries and wipe exterior clean.

3.2 PIPING INSULATION INSTALLATION:

A. Domestic Hot Water:

1. General: All domestic hot water piping, fittings and accessories shall be insulated.
2. Pipe: Apply pre-molded fiberglass sections to pipe using integral pressure sealing lap adhesive in accordance with manufacturer's recommendations. Stagger longitudinal joints. Seal butt joints with factory supplied pressure sealing tape.
3. Fittings and Valves:
 - a. Wrap all fittings and valves with pre-cut fiberglass blanket to thickness matching adjoining insulation. Cover blanket with PVC jacket in accordance with manufacturer's recommendations. Solvent weld. Seal all joints with factory supplied pressure sealing vapor barrier tape with 1-1/2" (min.) overlap on both sides of joint. Insulate valves to stem. Do not insulate unions, flanges or valves unless water temperature exceeds 140°F or the piping is exposed to weather.
 - b. For miscellaneous fittings and accessories for which PVC jackets are not available or where proximity of fittings precludes a neat-appearing installation, the Contractor may cover the fiberglass blanket with stretchable glass fabric, one coat of lagging adhesive and a final coat of vapor barrier coating. All exposed ends of insulation shall be adequately sealed.
4. Additional Finish for Exposed Piping and Equipment: All piping and equipment exposed to view but protected from the weather shall be given an additional finish of PVC jackets.

B. Cold Water Piping-Freeze Protection: All cold water piping exposed to weather shall be wrapped with insulating tape, 50% overlap. Cover valves to stem. Apply at least two coats of protective finish.

C. Piping Insulation Under Disabled Accessible Lavatories and Sinks: Hot and cold water piping, hot and cold water stop and drain piping under disabled accessible lavatories and sinks shall be insulated with 3/16" thick molded closed cell vinyl to prevent accidental injury due to contact or temperature extremes. Installation shall be in accordance with manufacturer's instructions. There shall be no sharp or abrasive surfaces under disabled accessible lavatories and sinks.

3.3 FIXTURE INSTALLATION

A. Fixture Height: Shall be as indicated on Architectural drawings.

B. Floor Drains or Floor Sinks: Shall be placed parallel to room surfaces, set level, flush with floor, and adjusted to proper height to drain. Cover openings during construction to keep all

foreign matter out of drain line.

- C. Wall Hung Fixtures: Shall be provided with proper backing and hanger plates secured to wall. Lavatories shall be supported with concealed arm supports. Fixtures mounted on carriers shall bear against stop nuts, clear of wall surface. Caulk fixtures against walls with white G.E. "Sanitary 1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).
- D. Floor Mounted Fixtures: Shall be provided with proper support plates. Grout at the floor with waterproof ceramic tile grout.
- E. Other Connections: Rough-in and connection for trim or fixtures supplied by others shall be included in this specification section.

3.4 EQUIPMENT INSTALLATION

- A. General: It shall be the responsibility of the equipment installer to insure that no work done under other specification sections shall in any way block, or otherwise hinder the equipment. All equipment shall be securely anchored in place.
- B. Connections to Equipment: Where size changes are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

3.5 TESTS AND ADJUSTMENTS

- A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Engineer. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested. Tests may be made in sections, however, all connections between sections previously tested and new section shall be included in the new test.
- B. Gravity Systems:
 - 1. Sanitary Sewer: All ends of the sanitary sewer system shall be capped and lines filled with water to the top of the highest vent, 10' above grade minimum. This test shall be made before any fixtures are installed. Test shall be maintained until all joints have been inspected, but no less than 2 hours.
 - 2. Drains (Including Condensate): Similar to Sanitary Sewer.
- C. Pressure Systems:
 - 1. General: There shall be no drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be

isolated from system before test is made.

2. Domestic Hot and Cold Water Piping: Maintain 100 psig water pressure for 4 hours.
3. Gas Piping: Maintain 100 psig air pressure for 4 hours.

3.6 DISINFECTION

- A. Disinfect all domestic water piping systems in accordance with AWWA Standard C651, "AWWA Standard for Disinfecting Water Mains", and in accordance with administrative authority. Disinfection process shall be performed in cooperation with health department having jurisdiction and witnessed by a representative of the Engineer. During procedure signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, water samples shall be collected for bacteriological analysis. Certificate of Bacteriological Purity shall be obtained and delivered to the Owner through the Engineer.

END OF SECTION

SECTION 23 01 00 – GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section covers and applies to all work included in Divisions 21 through 25.
- B. Work in this Section includes providing labor, materials, equipment, services necessary, fabrication, installation and testing for fully operational and safe systems including all necessary materials, appurtenances and features whether specified or shown in the contract documents or not, in conformity with all applicable codes and authorities having jurisdiction for the following:
 - 1. Mechanical work covered by all sections within Divisions 21, 22, 23 and 25 of the specifications, including, but not limited to:
 - a. Heating, ventilating and air conditioning systems and equipment.
 - b. Plumbing systems and equipment.
 - c. Control systems.
 - d. Testing and balancing.
- C. Provide cutting and patching, for the Mechanical Work.
- D. Provide piping from plumbing terminations, 10 feet from equipment, for water, gas, sanitary sewer and waste.
- E. Provide drain piping for all equipment requiring drainage to floor drains, roof, sink, or funnel drains.

1.3 RELATED WORK AND REQUIREMENTS

- A. Carefully check the documents of each section with those of other sections and Divisions. Ascertain the requirements of any interfacing materials or equipment being furnished and/or installed by those sections and Divisions, and provide the proper installation and/or required interface.

1.4 QUALITY ASSURANCE

- A. Supply all equipment and accessories in compliance with the applicable standards listed in article 1.6 of this section and with all applicable national, state and local codes.
- B. All items of a given type shall be the products of the same manufacturer, unless otherwise specified herein.

1.5 SUBMITTALS

- A. Submit shop drawings, product data, samples and certificates of compliance required by Division 01.
- B. Product Data Submittals: Submit manufacturers standard published data. Mark each copy to identify applicable products, models, options, accessories and other data. Supplement manufacturers standard data to provide information specific to this project.
- C. Organize submittals in sequence according to Specification Section. Submit in single electronic PDF document with tabs identifying each Specification Section. Provide Table of Contents identifying the Specification Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package by Division at one time. Do not submit individual Sections piecemeal.
- D. In addition to the submittal requirements of Divisions 21, 22, 23 and 25, submit product data for the following items per the provisions Division 01:
 - 1. All Equipment and Fixtures indicated in Schedules on Drawings.
 - 2. Access panels
- E. If more than two submissions are required (initial submittal and one resubmittal) based on rejection or lack of compliance by submittal, then the Contractor shall:
 - 1. Arrange for additional reviews by the Design Engineers.
 - 2. Pay all costs for such additional reviews.
- F. Corrections or comments made on the shop drawings during review do not relieve the Contractor from compliance with requirements of the drawings and specifications. Shop drawing checking by the Engineer is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for:
 - 1. Confirming and correlating all quantities and dimensions.
 - 2. Selecting fabrication processes and techniques of construction.
 - 3. Coordinating his work with that of all other trades.
 - 4. Performing his work in a safe and satisfactory manner.

G. Substitutions:

1. Prior to Bid shall be in accordance with Division 01.
2. After award of contract, submit separate substitution request for each substitution in accordance with the requirements hereinbelow. Support each request with:
 - a. Complete data substantiating compliance of proposed substitution with requirements stated in Contract documents.
 - b. Data relating to changes in construction schedule.
 - c. Any effect of substitution on other Work in this and other Divisions, and any other related contracts, and changes required in other work or products.
3. Contractor shall be responsible at no extra cost to Owner for any changes resulting from proposed substitutions which affect work of other Sections or Divisions, or related contracts.
4. Claims for additional costs caused by substitution that may subsequently become apparent shall be met by the Contractor.
5. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.
6. Substitutions will not be considered for acceptance when acceptance will require revision of Contract Documents, unless Contractor bears cost of redesign.
 - a. Arrange for required redesign by Engineer.
 - b. Pay all costs for such redesign.
 - c. All subject to Architect's approval.
7. Approval of substitutions shall not relieve Contractor from full compliance with requirements of Contract documents.

H. As-built (Record) Drawings:

1. Shall be in accordance with Division 01.
2. Provide after installation is complete. Final signoff and Client acceptance will not occur prior to submission of As-built drawings to Architect/Engineer.
3. Indicate as-built conditions and all revisions, fully illustrating all revisions made by all trades in the course of work.
4. Dimension physical locations of ductwork, and piping with reference elevations and distances above finished floors, below beams, from wall faces, underground

(invert elevations) and from column lines.

5. Exact location, type and function of concealed valves, dampers, controllers, piping, air vents, piping drains and isolators.
6. Indicate all equipment sizes and capacities and tag numbers.
7. Provide drawing on reproducible bond.
8. These drawings shall be for as-built record purposes for the Owner's use and are not considered shop drawings.

I. Operating Instructions, Maintenance Manuals and Parts Lists:

1. Before requesting acceptance of work, submit one set for review by Architect/Engineer.
2. After review, furnish two (2) printed and bound sets.
3. Include:
 - a. Installers name, address, telephone number and representatives name, and website address.
 - b. Manufacturer's name, model number, service manual, spare-parts list, and descriptive literature for all components, cross referenced and numbered on Record Drawings, and in accordance with Title 24 as required.
 - c. Maintenance instructions.
 - d. Listing of possible breakdown and repairs.
 - e. Instruction for starting, operation and programming.
 - f. Detailed and simplified one line, color coded flow and wiring diagram.
 - g. Field test report, including:
 - 1) Instrument set points.
 - 2) Normal operating values.
 - h. Name, address and phone number of contractors equipment suppliers and service agencies.
 - i. Assemble manufacturer's equipment manuals in chronological order, following the specification alpha-numeric system, in heavy duty 3-ring binders clearly titled on the spine and front cover with appropriate index dividers.

J. Special Tools:

1. One set of any special tools required to operate, adjust, dismantle or repair equipment furnished under any section of this Division.
2. "Special tools": those not normally found in possession of mechanics or maintenance personnel.
3. Tag each item and cross reference in Maintenance Manual.
4. Turn over to Owner's representative or temporarily secure to unit at Architect's instruction.

K. Quantity of Submittals Required:

1. Product Data (brochures):
 - a. Submit electronic PDF copy of product data.
 - b. If comments are required, comment sheet(s) will be returned with submittal.
2. Samples:
 - a. Submit as required in each specification section.

1.6 REFERENCE STANDARDS

- A. Reference standards of industry organizations, manufacturer associates and professional associations that publish standards of construction and/or materials that are referenced in this Division are listed in Division 01. The Standards as referenced in this Specification shall be considered as attached and binding to the requirements of the Construction Documents. The Contractor is to be considered as knowledgeable of these Standards and their requirements for the performance of the Work.

1.7 CODE COMPLIANCE

- A. In addition to complying with all other legal requirements, comply with current provisions of governing codes and regulations in effect during progress of the Work, and with the following:
1. Drawings and specification requirements shall govern where they exceed Code and Regulation requirements.
 2. Where requirements between governing Codes and Regulations vary, the more restrictive provisions shall apply.
 3. Nothing contained in Contract Documents shall be construed as authority or permission to disregard or violate legal requirements. The Contractor shall

immediately draw the attention of the Architect to any such conflicts noted in the Contract Documents.

1.8 DESCRIPTION OF BID DOCUMENTS

A. General:

1. Words or phrases such as "The Contractor shall," "shall be," "furnish," provide," "connect," "a," "an," "the," and "all" etc. may be omitted for brevity.
2. The Drawings and Specifications are complimentary each to the other. Where discrepancies occur between the Drawings and Specifications, the more stringent provisions shall apply.
3. Examine all drawings and specifications prior to bidding the work. Report any discrepancies to the Engineer.

B. Specifications:

1. Specifications, in general, describe quality and character of materials and equipment and the Standards that govern. Contractor is responsible for design and construction costs incurred for equipment and materials other than the Basis of Design, including but not limited to architectural, structural, electrical, HVAC, fire sprinkler and plumbing.
2. Specifications are of simplified form and include incomplete sentences.

C. Drawings:

1. Drawings in general are diagrammatic and indicate scope, sizes, routing, locations, connections to equipment and methods of installation, but not necessarily offsets, obstructions or structural conditions. Drawings are not intended to show every item, fitting, transition or offset in its exact dimension or detail of equipment or proposed system layout. Locations on drawings may be distorted for purposes of clearness and legibility.
2. Contractor to provide additional offsets, fittings, hangers, supports, valves, drains as required for construction and coordination with work of other trades.
3. Before proceeding with work, ordering or fabricating materials, check and verify all dimensions and carefully check space requirements with other Work to ensure that all equipment and materials can be installed in spaces allotted.
4. Contractor to assume all responsibility for fitting of materials and equipment to other parts of equipment and structure.
5. The Contractor is responsible for installing the work in such a manner that it will conform to the structure and architectural elements, avoid obstructions, maintain headroom, leave adequate clearance for proper maintenance and repairs, and

- provide clearances and access required by codes. Do not scale distances off of mechanical drawings. Use actual field measured building dimensions.
6. Make adjustments that may be necessary or requested in order to resolve space problems, preserve headroom, and avoid architectural openings, structural members and work of other trades.
 7. Above items to be performed at no additional cost to the Owner.
- D. Typical details, where shown on the drawings, apply to each and every item of the project where such items are applicable. Typical details are not repeated in full on the plans, and are diagrammatic only, but with the intention that such details shall be incorporated in full.

1.9 DEFINITIONS

- A. "Piping": pipe, tube, fittings, flanges, valves, controls, strainers, hangers, supports, unions, traps, drains, insulation, and related items.
- B. "Motor Controllers": manual or magnetic starters (with or without switches), individual pushbuttons or hand-off-automatic (HOA) switches controlling the operation of motors.
- C. "Control" or "Actuating Devices": automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.

1.10 JOB CONDITIONS

- A. Adjoining work of other Divisions shall be examined for interferences and conditions affecting this Division.
- B. Examine site related work and surfaces before starting work of any Section.
 1. Report to Architect, in writing, conditions which will prevent proper provision of this work.
 2. Beginning work of any Section without reporting unsuitable conditions to Architect constitutes acceptance of conditions by Contractor.
 3. Perform any required removal, repair or replacement of this work caused by unsuitable conditions at no additional cost to Owner.
- C. Connections to existing work.
 1. Unknown conditions will be addressed if reasonable.
 2. Contractor shall field verify existing dimensions prior to ordering or fabricating materials.

3. Install new work and connect to existing work with minimum interference to existing facilities.
 4. Temporary shutdowns of existing services:
 - a. At no additional charges.
 - b. At times not to interfere with normal operation of existing facilities.
 - c. Provide 48 hour notification.
 5. Maintain continuous operation of existing facilities as required with necessary temporary connections between new and existing work.
 6. Restore existing disturbed work to original condition.
- D. Removal and relocation of existing work.
1. Disconnect, remove or relocate material, equipment, plumbing fixtures, piping and other work noted and required by removal or changes in existing construction.
 2. Where existing pipes, conduits and/or ducts which are to remain prevent installation of new work as indicated, relocate, or arrange for relocation, of existing pipes, conduits and/or ducts.
 3. Provide new material and equipment required for relocated equipment.
 4. Plug or cap active piping or ductwork behind or below finish.
 5. Do not leave long dead-end branches. Cap or plug as close as possible to active line.
 6. Remove unused piping, ductwork and material.
 7. Dispose of removed fixtures and equipment as directed.
 8. Turn over removed fixtures and equipment to Owner as directed.
- E. Special Traffic Requirements:
1. Maintain emergency and service entrances useable to pedestrian, truck, and ambulance traffic at all times.
 2. Where trenches are cut, provide adequate bridging for above-mentioned traffic.

1.11 TEMPORARY FACILITIES

- A. See Division 01 for temporary facilities required.

1.12 SCHEDULE OF WORK

- A. Arrange work to conform to schedule of construction established or required to comply with Contract Documents.
- B. In scheduling, anticipate means of installing equipment through available openings in structure.
- C. Confirm in writing to Architect, within 30 days of signing of contract, anticipated number of days required to perform test, balance, and acceptance testing of mechanical systems:
 - 1. This phase must occur after completion of mechanical systems, including all control calibration and adjustment, and requires substantial completion of the building, including closure, ceilings, lighting, partitioning, etc.
 - 2. Submit for approval at this time, names and qualifications of test and balancing agencies to be used.

1.13 NOISE REDUCTION

- A. Cooperate in reducing objectionable noise or vibration caused by mechanical systems.
 - 1. To extent of adjustments to specified and installed equipment and appurtenances.
- B. Correct noise problems caused by failure to install work in accordance with Contract Documents. Include labor and materials required as result of such failure.

PART 2 - PRODUCTS

2.1 ACCESS DOORS

- A. Size for proper access, adjusting and maintenance:
 - 1. 12 in. x 12 in. minimum for valves, trap primers, shock absorbers, etc.
 - 2. 24 in. x 24 in. for man access to concealed fans, coils, etc., unless indicated otherwise.
- B. Provide as required by work in this Division.
- C. Style, Color and Finish to match adjacent construction and as approved by Architect.

PART 3 - EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

- A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site through the construction of the project.

3.2 CUTTING AND PATCHING

- A. All carpentry, cutting and patching to be done under trades doing that work. Work shall be done in accordance with Division 01.
- B. Provide all carpentry, cutting and patching required for proper installation of material and equipment specified in Divisions 21, 22, 23 and 25.
- C. Do not cut, notch or drill structural members without consent of Architect.
- D. All cutting and repairing shall conform to Title 21 of California Administrative Code.

3.3 CONCRETE ANCHORS

- A. Steel bolt with expansion anchor requiring a drilled hole – powder driven anchors are not acceptable.
- B. Minimum concrete embedment shall be 4-1/2 diameters unless otherwise noted on plans.
- C. Minimum spacing shall be 12 diameters center to center and 6 diameters center to edge of concrete unless otherwise noted on plans.
- D. Maximum allowable stresses for tension and shear shall be 80% of the ICBO test report values. Hilti, Phillips, Wej-It.

3.4 EQUIPMENT ANCHORING

- A. All equipment shall be securely anchored in accordance with CBC.
- B. All equipment mounted on concrete shall be secured with a concrete anchor as specified above at each mounting point.
- C. Secure base plate as indicated above.

3.5 SUPPORTS AND SEISMIC RESTRAINTS

- A. All mechanical systems (all ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance with Seismic Hazard Level 'A' of the "Guidelines for Seismic Restraint Manual: Guidelines for Mechanical Systems", current issue, as published by the Sheet Metal and Air Conditioning Contractors National Association,

Inc. (SMACNA), Chantilly, Virginia and in accordance with CBC.

3.6 WATER PROOFING

- A. Under General Construction Work.
- B. Where any work pierces waterproofing, installation shall be subject to review.
 - 1. Provide all necessary sleeves, caulking, flashing and flashing fittings required to make openings absolutely watertight.
- C. Flashing:
 - 1. Mechanical Contractor shall provide flashing for all work in this Division, unless otherwise provided by roofing installer, as required to accommodate roof slope, roofing material, and roof installation method. No additional costs will be paid for lack of familiarity of Contractor with roofing type or slope.
 - 2. Mechanical Contractor shall be responsible for coordinating size of penetrations and locations with roofing contractor.
 - 3. Mechanical Contractor shall be responsible for scheduling installation of piping and other penetrations through roof structural system to exterior that they are complete and secure for the orderly installation of the roofing system.
 - 4. 4 lb. lead.
 - 5. 16 oz. lead coated copper.
 - 6. No.22 USSG aluminum.
 - 7. Fittings for piping through roof:
 - a. Galvanized cast iron bottom recess roof type.
 - b. Similar to Josam No. 26440 or No. 26450.
- D. Provide weather protection canopies, hoods or enclosures over out-of-door equipment which could be damaged by exposure to weather.
 - 1. This requirement applies to:
 - a. Motors and drives.
 - b. Controls.
 - c. Instruments.
 - 2. Identify items under such covers if entirely enclosed.

3.7 ACCESS TO VALVES AND EQUIPMENT

- A. Access shall be possible where valves, expansion joints, fire dampers, motors, filters, control devices, and any other equipment requiring access for servicing, repairs, or maintenance are located in walls, soffits, chases, and/or above ceilings.
- B. Definition of Accessible:
 - 1. Valves and dampers may be operated.
 - 2. Control devices may be adjusted.
 - 3. Fire dampers may be reset.
 - 4. Equipment access panels may be opened.
 - 5. Normal maintenance work such as replacement of filters, lubrication of bearings, etc., may be performed readily within arm's reach of access opening.
 - 6. It shall not be necessary to crawl through furred ceiling space to perform such operations.
- C. Install piping, equipment and accessories to permit easy access for maintenance.
- D. Group concealed valves, expansion joints, controls, dampers and equipment requiring service access, so as to be freely accessible through access doors and to minimize the number of access doors required.
- E. Relocate piping equipment and accessories as required, at no extra cost to afford proper maintenance access.
- F. Coordinate location of access panels with applicable trades installing walls or ceiling.
 - 1. Coordinate panel locations with lights and other architectural features.
 - 2. Submit proposed panel locations to Architect for review.
- G. Arrange for location and marking of removable tiles in splined ceilings where access panels are not installed.
- H. Existing Structures:
 - 1. When installation requires access openings through existing construction, coordinate location of necessary access panels, and arrange for respective trades to provide openings and framing which may be required.
 - 2. Restore adjoining existing surfaces to original condition after new access panels have been installed.

3.8 CLEANING AND ADJUSTING

- A. Work to be painted: Brush and clean work prior to concealing, painting and acceptance. Perform in stages if directed.
- B. Painted or exposed work soiled or damaged: Clean, repair and paint to match adjoining work before final acceptance.
- C. Remove debris from inside and outside of materials and equipment.
- D. Flush out piping after installation.
- E. Adjust valves and automatic control devices.
- F. Traps, wastes and supplies: unobstructed.

3.9 FIELD QUALITY CONTROL

- A. Refer to Division 01.
- B. Tests:
 - 1. Perform as specified in individual Divisions, and as required by authorities having jurisdiction.
- C. Furnish written report and certification that tests have been satisfactorily completed.
- D. Repair or replace defective work, as directed.
- E. Pay for restoring or replacing damaged work due to tests, as directed.
- F. Pay for restoring or replacing damaged work of others, due to tests, as directed.

3.10 TRAINING

- A. Provide training by qualified manufacturers' representatives for equipment as specified in this Division.
- B. Training to include:
 - 1. Site-specific training.
 - 2. Minimum hours as specified in each Section.
 - 3. Training materials (minimum six sets).
 - 4. Electronic media available from the manufacturer [two (2) copies].
- C. Each training session to be scheduled with Owner at least 30 days in advance.

GENERAL MECHANICAL
PROVISIONS

2310

END OF SECTION

SECTION 23 05 00 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Mechanical sleeve seals.
 - 3. Sleeves.
 - 4. Escutcheons.
 - 5. Equipment installation requirements common to equipment sections.
 - 6. Painting and finishing.
 - 7. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. CPVC: Chlorinated polyvinyl chloride plastic.
 - 2. PE: Polyethylene plastic.
 - 3. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 SUBMITTALS

- A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Access doors

- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- C. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.

2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- C. Pressure Plates: Carbon steel or Stainless steel. Include two for each sealing element.
- D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

- A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- B. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

- C. PVC Pipe: ASTM D 1785, Schedule 40.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.

2.7 ACCESS DOORS

- A. Size for proper access, adjusting and maintenance:
 - 1. 12 in. x 12 in. minimum for valves, volume dampers, etc.
 - 2. 24 in. x 24 in. for man access to concealed fans, coils, fire/smoke dampers, etc., unless indicated otherwise.
- B. Provide as required by work in Division 21, 22, 23, and 25.
- C. Style, color, and finish to match adjacent construction and as approved by Architect.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Sleeves are not required for core-drilled holes.
- N. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. PVC or Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - 1) Seal space outside of sleeve fittings with grout.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint.
- O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten

bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- Q. Verify final equipment locations for roughing-in.
- R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2-1/2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 ACCESS TO VALVE AND EQUIPMENT

- A. Access shall be possible where valves, expansion joints, fire dampers, motors, filters, control devices, and any other equipment requiring access for servicing, repairs, or maintenance are located in walls, soffits, chases, and/or above ceilings.
- B. Definition of Accessible:
 - 1. Valves and dampers may be operated.
 - 2. Control devices may be adjusted.
 - 3. Fire dampers may be reset.
 - 4. Equipment access panels may be opened.
 - 5. Normal maintenance work such as replacement of filters, lubrication of bearings, etc., may be performed readily within arm's reach of access opening.
 - 6. It shall not be necessary to crawl through furred ceiling space to perform such operations.
- C. Install piping, equipment and accessories to permit easy access for maintenance.
- D. Group concealed valves, expansion joints, controls, dampers and equipment requiring service access, so as to be freely accessible through access doors and to minimize the number of access doors required.
- E. Relocate piping equipment and accessories as required, at no extra cost to afford proper maintenance access.
- F. Coordinate location of access panels with applicable trades installing walls or ceiling.
 - 1. Coordinate panel locations with lights and other architectural features.
 - 2. Submit proposed panel locations to Architect for review.
- G. Arrange for location and marking of removable tiles in splined ceilings where access panels are not installed.

3.6 PAINTING

- A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

3.8 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

END OF SECTION

SECTION 23 05 29 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE 7-16.
 1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

- #### A.
- Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- #### A.
- Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.
- #### B.
- Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength.
- #### C.
- For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- #### D.
- For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- #### E.
- Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - 5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 3. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 4. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 5. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 4. C-Clamps (MSS Type 23): For structural shapes.
 5. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 05 53 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

1.2 SUBMITTAL

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch (0.8-mm) or anodized aluminum, 0.032-inch (0.8-mm) minimum thickness and having predrilled or stamped holes for attachment hardware.
 - 2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
 - 3. Minimum Letter Size: 1/2 inch (13 mm). Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 4. Fasteners: Stainless-steel rivets or self-tapping screws.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, and Room number of primary space served (where thermostat is located). Coordinate with District to match final installed room numbering.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

- B. Letter Color: Red.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
- F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, and pipe size.
 - 1. Lettering Size: At least 1-1/2 inches (38 mm) high.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting."
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 20 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
- C. Pipe Label Color Schedule:
 - 1. Refrigerant Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.

END OF SECTION

SECTION 23 07 00 – HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Insulation Materials:
 - a. Calcium silicate.
 - b. Cellular glass.
 - c. Flexible elastomeric.
 - d. Mineral fiber.
- 2. Fire-rated insulation systems.
- 3. Insulating cements.
- 4. Adhesives.
- 5. Mastics.
- 6. Lagging adhesives.
- 7. Sealants.
- 8. Factory-applied jackets.
- 9. Field-applied fabric-reinforcing mesh.
- 10. Field-applied cloths.
- 11. Field-applied jackets.
- 12. Tapes.
- 13. Securements.
- 14. Corner angles.

B. Related Sections:

- 1. Division 21 Section "Fire-Suppression Systems Insulation."
- 2. Division 22 Section "Plumbing Insulation."
- 3. Division 23 Section "Metal Ducts" for duct liners.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Calcium Silicate:
 - 1. Preformed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
 - 2. Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
 - 3. Prefabricated Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
- G. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cell-U-Foam Corporation; Ultra-CUF.
 - b. Pittsburgh Corning Corporation; Foamglas Super K.
 - 2. Block Insulation: ASTM C 552, Type I.
 - 3. Special-Shaped Insulation: ASTM C 552, Type III.
 - 4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- H. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Aeroflex USA Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
- I. 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. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; All-Service Duct Wrap.
- J. Mineral-Fiber, Preformed Pipe Insulation:
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000 Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 2. 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. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- K. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; CrimpWrap.
 - b. Johns Manville; MicroFlex.
 - c. Knauf Insulation; Pipe and Tank Insulation.

- d. Manson Insulation Inc.; AK Flex.
- e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Childers Products, Division of ITW; CP-35.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-90.
 - c. ITW TACC, Division of Illinois Tool Works; CB-50.
 - d. Marathon Industries, Inc.; 590.
 - e. Mon-Eco Industries, Inc.; 55-40.
 - f. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
 5. Color: White.

2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; CP-52.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-42.
 - c. Marathon Industries, Inc.; 130.
 - d. Mon-Eco Industries, Inc.; 11-30.
 - e. Vimasco Corporation; 136.
 2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
 3. Service Temperature Range: Minus 50 to plus 180 deg F.
 4. Color: White.

2.6 SEALANTS

- A. Joint Sealants:
 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Permanently flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 4. Color: White or gray.
 5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. FSK and Metal Jacket Flashing Sealants:
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; CP-76-8.
 - b. Foster Products Corporation, H. B. Fuller Company; 95-44.

- c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Vimasco Corporation; 750.
- 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 5. Color: Aluminum.
 - 6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; CP-76.
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 5. Color: White.
 - 6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
- 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 - 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 - 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 - 5. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.
- B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. inch for covering equipment.

2.9 FIELD-APPLIED CLOTHS

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.10 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto PVC Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 - e. <Insert manufacturer's name; product name or designation.>
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: Color-code jackets based on system within Central Plant. Color as selected by Architect. All other areas to be white.
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
 - 5. Factory-fabricated tank heads and tank side panels.
- D. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; Metal Jacketing Systems.
 - b. PABCO Metals Corporation; Surefit.
 - c. RPR Products, Inc.; Insul-Mate.
2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 - a. Finish and thickness are indicated in field-applied jacket schedules.
 - b. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper
 - c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
 - d. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.11 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Width: 3 inches.
 2. Thickness: 11.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Width: 3 inches.
 2. Thickness: 6.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.12 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products; Bands.
 - b. PABCO Metals Corporation; Bands.
 - c. RPR Products, Inc.; Bands.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with closed seal.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch diameter shank, length to suit depth of insulation indicated.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AGM Industries, Inc.; CWP-1.
 - 2) GEMCO; CD.
 - 3) Midwest Fasteners, Inc.; CD.
 - 4) Nelson Stud Welding; TPA, TPC, and TPS.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - a. Products: Subject to compliance with requirements, [available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AGM Industries, Inc.; CWP-1.
 - 2) GEMCO; Cupped Head Weld Pin.
 - 3) Midwest Fasteners, Inc.; Cupped Head.
 - 4) Nelson Stud Welding; CHP.
3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AGM Industries, Inc.; RC-150.
 - 2) GEMCO; R-150.
 - 3) Midwest Fasteners, Inc.; WA-150.
 - 4) Nelson Stud Welding; Speed Clips.

- b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

2.13 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 - 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation,

install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Mineral Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
 - a. Do not weld anchor pins to ASME-labeled pressure vessels.
 - b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
 - c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
 - d. Do not overcompress insulation during installation.
 - e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
 - f. Impale insulation over anchor pins and attach speed washers.

- g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
 6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
 7. Stagger joints between insulation layers at least 3 inches.
 8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
 9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
 10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.
- B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.
 1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
 2. Seal longitudinal seams and end joints.
- C. 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.
 2. Fabricate boxes from aluminum, 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.

3.6 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe

- insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.7 CELLULAR-GLASS INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

3.8 MINERAL-FIBER INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.9 FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 1. Indoor, concealed supply and outdoor air.
 2. Indoor, exposed supply and outdoor air.
 3. Indoor, concealed return located in nonconditioned space.
 4. Indoor, exposed return located in nonconditioned space.
- B. Items Not Insulated:
 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 2. Factory-insulated flexible ducts.
 3. Factory-insulated plenums and casings.
 4. Flexible connectors.
 5. Vibration-control devices.
 6. Factory-insulated access panels and doors.

3.11 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. Ft nominal density.
- B. Concealed, round and flat-oval, return-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. Ft nominal density.
- C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- D. Concealed, rectangular, supply-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. Ft nominal density.
- E. Concealed, rectangular, return-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb/cu. Ft nominal density.
- F. Concealed, rectangular, outdoor-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

3.12 EQUIPMENT INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.
- B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.
- C. Chillers: Insulate cold surfaces on chillers, including, but not limited to, evaporator bundles, condenser bundles, suction piping, compressor inlets, tube sheets, water boxes, and nozzles with the following:
 - 1. Flexible Elastomeric: 1 inch thick.
- D. Dual Temp Water pump insulation shall be the following:
 - 1. Flexible Elastomeric: 1.5 inch thick.
- E. Dual Temp Water expansion tank and buffer tank insulation shall be one of the following:
 - 1. Calcium Silicate: 2 inches thick.
- F. Dual Temp Water air-separator insulation shall be the following:
 - 1. Cellular Glass: 1-1/2 inches thick.
 - 2. Flexible Elastomeric: 1 inch thick.

3.13 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.14 INDOOR PIPING INSULATION SCHEDULE

A. Dual Temp Water Supply and Return:

1. NPS 2-1/2 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 1-1/2 inches thick.
2. NPS 3 and larger: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

3.15 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Dual Temp Water Supply and Return:

1. All Pipe Sizes: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.16 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Ducts and Plenums, Concealed:
 1. None.
- D. Piping, Concealed:
 1. PVC: 20 mil thick
- E. Piping, Exposed:
 1. PVC: 20 mil thick

3.17 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. Aluminum, Smooth: 0.020 inch thick.
- D. Piping, Exposed:
 - 1. Aluminum, Smooth: 0.020 inch thick.

END OF SECTION

SECTION 23 31 13 – METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.
7. Seismic-restraint devices.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.3 SUBMITTALS

A. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.

B. Shop Drawings:

1. Building information modeling (BIM) process shall be performed at an LOD-400 level as part of developing the shop drawing and includes but is not limited to creating model of 3D objects in Revit or AutoCAD based program, modeling objects accurately based on

- actual cut lengths and with access and clearance requirements incorporated, and coordinating with all MEP trades.
- 2. Deliverables to engineer: Detail, 1/4 inch equals 1 foot scale drawings.
- C. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." Provide Drive Slip or Hemmed "S" Slip or approved equal.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." Provide Drive Slip or Hemmed "S" Slip or approved equal.
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. McGill AirFlow LLC.
 - b. SEMCO Incorporated.
 - c. Sheet Metal Connectors, Inc.
 - d. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- 1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- 1. Fabricate round ducts larger Than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
- 1. Galvanized Coating Designation: G60 (Z180).
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

- E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 2. Maximum Thermal Conductivity:
 - a. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F (0.033 W/m x K) at 75 deg F (24 deg C) mean temperature.
 - 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Insulation Pins and Washers:
 - 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
 - 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.

6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
 6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- E. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.7 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.; a division of Cooper Industries.
 2. Kinetics Noise Control.
 3. Mason Industries.
 4. TOLCO; a brand of NIBCO INC.
 5. Unistrut Corporation; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.
1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A 603, galvanized or ASTM A 492, stainless-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors installed and/or stored on site from moisture, construction debris and dust, and other foreign materials.
 - 1. Cover and seal open ends of ducts with plastic wrap and duct tape.
 - 2. Turn off ventilation system and protect duct interiors from dust infiltration during dust producing activities (e.g. demolition, drywall installation, finishing).
 - 3. At the end of each workday, cover and seal open ends or openings of installed ducts with plastic wrap and duct tape.

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with ASCE/SEI 7.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

- A. Paint exterior of metal ducts that are visible. Paint materials and application requirements are specified in Division 09 painting Sections.

3.8 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.

3.9 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated.
- B. Supply and Return Ducts:
 - 1. Ducts:
 - a. Pressure Class: Positive 2-inch wg (500 Pa).
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- C. Exhaust Ducts:
 - 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 2-inch wg (500 Pa).
 - b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 - 2. Grease Ducts Connected to Kitchen Hoods:
 - a. Welded black steel with continuous liquid tight joint per SMACNA.

- b. OR UL 1978 and UL 2221 certified factory-build duct
- c. Pressure Class: Positive or negative 4-inch wg (500 Pa).

D. Intermediate Reinforcement:

- 1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.
- 2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.

E. Liner:

- 1. Supply Air Ducts: Fibrous glass, Type II, 1-1/2 inches (38 mm) thick.
- 2. Return Air Ducts: Fibrous glass, Type II, 1-1/2 inches (38 mm) thick.
- 3. Supply Fan Plenums: Fibrous glass, Type II, 1-1/2 inches (38 mm) thick.
- 4. Return- and Exhaust-Fan Plenums: Fibrous glass, Type II, 2 inches (51 mm) thick.
- 5. Supply, Return and Energy Recovery Ducts Exposed on Roof: Fibrous glass, Type II, 2 inches thick.

F. Elbow Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm (5 m/s) or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm (7.6 m/s) or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

- 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - 4) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Spot welded seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections" and details provided on drawings.
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: 45 degree Lead-In, Low-loss.
2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and details provided on drawings.
 - a. All shall be 45-degree lateral.

END OF SECTION

SECTION 23 33 00 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Backdraft and pressure relief dampers.
 - 2. Manual volume dampers.
 - 3. Combination fire and smoke dampers.
 - 4. Corridor dampers.
 - 5. Flange connectors.
 - 6. Turning vanes.
 - 7. Remote damper operators.
 - 8. Duct-mounted access doors.
 - 9. Flexible connectors.
 - 10. Flexible ducts.
 - 11. Duct accessory hardware.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and No. 3 finish for exposed ducts.
- D. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ventfabrics, Ventlok
 - 2. Duro Dyne Inc.
 - 3. Greenheck Fan Corporation.
 - 4. Nailor Industries Inc.
 - 5. Pottorff; a division of PCI Industries, Inc.
 - 6. Ruskin Company.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2000 fpm.
- D. Maximum System Pressure: 1-inch wg.
- E. Frame: 0.052-inch-thick, galvanized sheet steel, with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, maximum 6-inch width, [0.025-inch-thick, roll-formed aluminum with sealed edges.

- G. Blade Action: Parallel.
- H. Blade Seals: Vinyl foam.
- I. Blade Axles:
 - 1. Material: Galvanized steel or Stainless steel.
 - 2. Diameter: 0.20 inch.
- J. Return Spring: Adjustable tension.
- K. Bearings: Steel ball or Synthetic pivot bushings.
- L. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressure.
 - 2. Counterweights and spring-assist kits for vertical airflow installations.
 - 3. Electric actuators.
 - 4. Chain pulls.
 - 5. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20-gage minimum.
 - b. Sleeve Length: 6 inches minimum.
 - 6. Screen Mounting: Rear mounted.
 - 7. Screen Material: Galvanized steel or Aluminum.
 - 8. Screen Type: Bird.
 - 9. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Ventfabrics, Ventlok.
 - b. McGill AirFlow LLC.
 - c. METALAIRE, Inc.
 - d. Nailor Industries Inc.
 - e. Pottorff; a division of PCI Industries, Inc.
 - f. Ruskin Company.
 - g. Duro Dyne Inc.
 - 2. Standard leakage rating, with linkage outside airstream.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:

- a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 6. Blade Axles: Galvanized steel or Stainless steel.
 7. Bearings:
 - a. Molded synthetic or Stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 8. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
1. Size: 1-inch diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
1. Zinc-plated, spring loaded, serrated die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include elevated platform for insulated duct mounting.

2.4 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
 2. Nexus PDQ; Division of Shilco Holdings Inc.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: Roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.5 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. METALAIRE, Inc.
 - 4. SEMCO Incorporated.
 - 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
 - 6. Aero Dyne HEP
- B. Manufactured Turning Vanes for Metal Ducts: Double wall, hollow metal, airfoil shape blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."
- D. Vane Construction: Double wall.

2.6 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pottorff; a division of PCI Industries, Inc.
 - 2. Ventfabrics, Inc.
 - 3. Young Regulator Company.
- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Brass.
- D. Cable: Stainless steel.
- E. Wall-Box Mounting: Recessed, 2 inches deep.
- F. Wall-Box Cover-Plate Material: Stainless steel.

2.7 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. American Warming and Ventilating; a division of Mestek, Inc.

2. Cesco Products; a division of Mestek, Inc.
 3. Ductmate Industries, Inc.
 4. Flexmaster U.S.A., Inc.
 5. Greenheck Fan Corporation.
 6. McGill AirFlow LLC.
 7. Nailor Industries Inc.
 8. Pottorff; a division of PCI Industries, Inc.
 9. Ventfabrics, Inc.
 10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
- C. Pressure Relief Access Door:
1. Door and Frame Material: Galvanized sheet steel.
 2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
 3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
 4. Factory set at 10-inch wg.
 5. Doors close when pressures are within set-point range.
 6. Hinge: Continuous piano.
 7. Latches: Cam.
 8. Seal: Neoprene or foam rubber.
 9. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.8 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.

2. Flame Gard, Inc.
 3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.9 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Ventfabrics, Inc.
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 oz./sq. yd..
 2. Minimum Tensile Strength: 500 lbf/inch in the warp and 440 lbf/inch in the filling.
 3. Service Temperature: Minus 50 to plus 250 deg F.
- G. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.

2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.10 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Flexmaster U.S.A., Inc.
 2. McGill AirFlow LLC.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
 4. J.P. Lamborn Co.
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.
 1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 175 deg F.
 4. Insulation R-Value: R-8.
- C. Flexible Duct Connectors:
 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
 2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.11 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, outside-air and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire and smoke dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 2. Control devices requiring inspection.
 - 3. Kitchen exhaust ductwork.
 - 4. Elsewhere as indicated.
- I. Install access doors with swing against duct static pressure.
- J. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body plus Ladder Access: 25 by 17 inches.

- K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- L. Install flexible connectors to connect ducts to equipment.
- M. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- N. Connect terminal units to supply ducts directly.
- O. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- P. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.
- Q. Install duct test holes where required for testing and balancing purposes.
- R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.
 - 5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 23 34 23 – HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Utility set fans.
 - 2. Centrifugal roof ventilators.
 - 3. Upblast propeller roof exhaust fans.
 - 4. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on sea level.
- B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Roof curbs.
 - 7. Fan speed controllers.
- B. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations as detailed on plans

PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FANS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Greenheck
 - 2. Loren Cook Company.
 - 3. Penn Ventilation.
- B. Description: In-line, direct-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.
- C. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- D. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- E. Direct Drive Motors:
 - 1. Open type motor enclosure with DC electronic commutation type motor (ECM) specifically designed for fan applications.

2. Motors are permanently lubricated heavy duty ball bearing type to match with the fan load.
3. Motor speed controllable down to 20% of full speed, controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal
4. Motor shall be a minimum 85% efficient at all speeds.

F. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

G. Accessories:

1. Companion Flanges: For inlet and outlet duct connections.

2.2 MOTORS

- A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2.3 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Support units using elastomeric mounts, spring isolators, or restrained spring isolators as indicated on plans, having a static deflection of 1 inch. Vibration- and seismic-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- C. Support suspended units from structure using threaded steel rods and elastomeric hangers or spring hangers as indicated on plans having a static deflection of 1 inch. Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- D. Install units with clearances for service and maintenance.
- E. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Adjust belt tension.
 - 6. Adjust damper linkages for proper damper operation.
 - 7. Verify lubrication for bearings and other moving parts.
 - 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 - 10. Shut unit down and reconnect automatic temperature-control operators.
 - 11. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

END OF SECTION

SECTION 23 38 13 - COMMERCIAL-KITCHEN HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Type I commercial kitchen hoods.

1.3 DEFINITIONS

- A. Listed Hood: A hood, factory fabricated and tested for compliance with UL 710 by a testing agency acceptable to authorities having jurisdiction.
- B. Standard Hood: A hood, usually field fabricated, that complies with design, construction, and performance criteria of applicable national and local codes.
- C. Type I Hood: A hood designed for grease exhaust applications.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Listed hoods.
 - 2. Filters/baffles.
 - 3. Fire-suppression systems.
 - 4. Lighting fixtures.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

- A. Coordinate equipment layout and installation with adjacent Work, including lighting fixtures, HVAC equipment, plumbing, and fire-suppression system components.

PART 2 - PRODUCTS

2.1 HOOD MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 430.
 - 1. Minimum Thickness: 0.050 inch.
 - 2. Finish: Comply with SSINA's "Finishes for Stainless Steel" for recommendations for applying and designating finishes.
 - a. Finish shall be free from tool and die marks and stretch lines and shall have uniform, directionally textured, polished finish indicated, free of cross scratches. Grain shall run with long dimension of each piece.
 - 3. Concealed Stainless-Steel Surfaces: ASTM A 480/A 480M, No. 2B finish (bright, cold-rolled, unpolished finish).
 - 4. Exposed Surfaces: ASTM A 480/A 480M, No. 4 finish (directional satin).
 - 5. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Carbon-Steel Sheets: ASTM A 1008/A 1008M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.
 - 1. Minimum Thickness: 0.0478 inch.
- C. Galvanized-Steel Sheet: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation.
 - 1. Minimum Thickness: 0.052 inch.
- D. Zinc-Coated Steel Shapes: ASTM A 36/A 36M, zinc coated according to ASTM A 123/A 123M requirements.
- E. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Elastomeric sealant shall be NSF certified for commercial kitchen hood application. Sealants, when cured and washed, shall comply with requirements in 21 CFR, Section 177.2600, for use in areas that come in contact with food.
 - 1. Color: As selected by Architect from manufacturer's full range.
 - 2. Backer Rod: Closed-cell polyethylene, in diameter larger than joint width.
- F. Sound Dampening: NSF-certified, nonabsorbent, hard-drying, sound-deadening compound for permanent adhesion to metal in minimum 1/8-inch thickness that does not chip, flake, or blister.
- G. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene, or PVC that is nontoxic, stable, odorless, nonabsorbent, and unaffected by exposure to foods and cleaning compounds, and that passes testing according to UL 710.

2.2 GENERAL HOOD FABRICATION REQUIREMENTS

- A. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Make ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.
 - 1. Welded Butt Joints: Full-penetration welds for full-joint length. Make joints flat, continuous, and homogenous with sheet metal without relying on straps under seams, filling in with solder, or spot welding.
 - 2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.
 - 3. Where fasteners are welded to underside of equipment, finish reverse side of weld smooth and flush.
 - 4. Coat concealed stainless-steel welded joints with metallic-based paint to prevent corrosion.
 - 5. After zinc-coated steel is welded, clean welds and abraded areas and apply SSPC-Paint 20, high-zinc-dust-content, galvanizing repair paint to comply with ASTM A 780/A 780M.
- B. For metal butt joints, comply with SMACNA's "Kitchen Equipment Fabrication Guidelines."
- C. Where stainless steel is joined to a dissimilar metal, use stainless-steel welding material or fastening devices.
- D. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.
- E. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.
- F. In food zones, as defined in NSF, fabricate surfaces free from exposed fasteners.
- G. Cap exposed fastener threads, including those inside cabinets, with stainless-steel lock washers and stainless-steel cap (acorn) nuts.
- H. Fabricate pipe slots on equipment with turned-up edges sized to accommodate service and utility lines and mechanical connections.
- I. Fabricate enclosures, including panels, housings, and skirts, to conceal service lines, operating components, and mechanical and electrical devices including those inside cabinets, unless otherwise indicated.
- J. Fabricate seismic restraints according to SMACNA's "Kitchen Equipment Fabrication Guidelines," Appendix 1, "Guidelines for Seismic Restraints of Kitchen Equipment."
- K. Fabricate equipment edges and backsplashes according to SMACNA's "Kitchen Equipment Fabrication Guidelines."
- L. Fabricate enclosure panels to ceiling and wall as follows:

1. Fabricate panels on three side with same material as hood, and extend from ceiling to top of hood canopy and from canopy to wall.
2. Wall Offset Spacer: Minimum of 3 inches.
3. Wall Shelves and Overshelves: Fabricate according to SMACNA's "Kitchen Equipment Fabrication Guidelines," with minimum 0.0625-inch-thick, stainless-steel shelf tops.

2.3 TYPE I EXHAUST HOOD FABRICATION

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Greenheck.
 2. Captive-Aire Systems.
 3. Halton Company.
- B. Weld all joints exposed to grease with continuous welds, and make filters/baffles or grease extractors and makeup air diffusers easily accessible for cleaning.
1. Fabricate hoods according to NSF 2, "Food Equipment."
 2. Hoods shall be listed and labeled, according to UL 710, by a testing agency acceptable to authorities having jurisdiction.
 3. Hoods shall be designed, fabricated, and installed according to NFPA 96.
 4. Include access panels as required for access to fire dampers and fusible links.
 5. Duct Collars: Minimum 0.0598-inch-thick steel at least 3 inches long, continuously welded to top of hood and at corners.
- C. Hood Configuration: Exhaust and makeup air.
1. Makeup air shall be introduced through laminar-flow-type, perforated metal panels on front of hood canopy.
- D. Hood Style: Wall-mounted canopy.
- E. Filters/Baffles: Removable, stainless-steel, with spring-loaded fastening. Fabricate stainless steel for filter frame and removable collection cup and pitched trough. Exposed surfaces shall be pitched to drain to collection cup. Filters/baffles shall be tested according to UL 1046, "Grease Filters for Exhaust Ducts," by an NRTL acceptable to authorities having jurisdiction.
- F. Lighting Fixtures: Surface-mounted, incandescent fixtures and lamps with lenses sealed vaportight. Wiring shall be installed in conduit on hood exterior. Number and location of fixtures shall provide a minimum of 43 fc at 30 inches above finished floor.
1. Light switches shall be mounted in hood control panel.
 2. Lighting Fixtures: Incandescent complying with UL 1598.
- G. Comply with requirements in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls " for hood controls.
- H. Hood Controls: Wall-mounting control cabinet, fabricated of stainless steel.

1. Exhaust Fan: On-off switches shall start and stop the exhaust fan. Interlock exhaust fan with makeup air supply fan to operate simultaneously. Interlock exhaust fan with fire-suppression system to operate fan(s) during fire-suppression-agent release and to remain in operation until manually stopped. Include red pilot light to indicate fan operation. Motor starters shall comply with Division 26 Section "Enclosed Controllers."

- I. Capacities and Characteristics: As scheduled and detailed on plans.

2.4 WET-CHEMICAL FIRE-SUPPRESSION SYSTEM

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ansul Incorporated; a Tyco International Ltd. Company.
2. Badger Fire Protection.
3. Kidde Fire Systems.
4. Pyro Chem.

- B. Description: Engineered distribution piping designed for automatic detection and release or manual release of fire-suppression agent by hood operator. Fire-suppression system shall be listed and labeled for complying with NFPA 17A, "Wet Chemical Extinguishing Systems," NFPA 96 2011 Edition and UL300 standard 2005 by a qualified testing agency acceptable to authorities having jurisdiction.

1. Steel Pipe, NPS 2 and Smaller: ASTM A 53/A 53M, Type S, Grade A, Schedule 40, plain ends.
2. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300.
3. Piping, fusible links and release mechanism, tank containing the suppression agent, and controls shall be factory installed. Controls shall be in stainless-steel control cabinet mounted on hood. Furnish manual pull station for wall mounting. Exposed piping shall be covered with chrome-plated aluminum tubing. Exposed fittings shall be chrome plated.
4. Liquid Extinguishing Agent: Noncorrosive, low-pH liquid.
5. Furnish electric-operated gas shutoff valve with clearly marked open and closed indicator for field installation.
6. Fire-suppression system controls shall be integrated with controls for fans, lights, and fuel supply and located in a single cabinet for each group of hoods immediately adjacent.
7. Wiring shall have color-coded, numbered terminal blocks and grounding bar. Spare terminals for fire alarm, optional wiring to start fan with fire alarm, red pilot light to indicate fan operation, and control switches shall all be factory wired in control cabinet with relays or starters. Include spare terminals for fire alarm, and wiring to start fan with fire alarm.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Complete field assembly of hoods where required.
 - 1. Make closed butt and contact joints that do not require filler.
 - 2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish. Comply with welding requirements in Part 2 "General Hood Fabrication Requirements" Article.
- B. Install hoods and associated services with clearances and access for maintaining, cleaning, and servicing hoods, filters/baffles, grease extractor, and fire-suppression systems according to manufacturer's written instructions and requirements of authorities having jurisdiction.
- C. Make cutouts in hoods where required to run service lines and to make final connections, and seal openings according to UL 1978.
- D. Securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners, unless otherwise indicated.
- E. Install hoods to operate free from vibration.
- F. Install seismic restraints according to SMACNA's "Kitchen Equipment Fabrication Guidelines," Appendix 1, "Guidelines for Seismic Restraints of Kitchen Equipment."
- G. Install trim strips and similar items requiring fasteners in a bed of sealant. Fasten with stainless-steel fasteners at 24 inches o.c. maximum.
- H. Install sealant in joints between equipment and abutting surfaces with continuous joint backing, unless otherwise indicated. Provide airtight, watertight, vermin-proof, sanitary joints.
- I. Install lamps, with maximum recommended wattage, in equipment with integral lighting.
- J. Set initial temperatures, and calibrate sensors.
- K. Set field-adjustable switches.

3.3 CONNECTIONS

- A. Connect ducts according to requirements in Division 23 Section "Air Duct Accessories." Install flexible connectors on makeup air supply duct. Weld exhaust-duct connections with continuous liquid tight joint.
- B. Install fire-suppression piping for remote-mounted suppression systems according to UL300 and NFPA 17A, "Wet Chemical Extinguishing Systems."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Test each equipment item for proper operation. Repair or replace equipment that is defective, including units that operate below required capacity or that operate with excessive noise or vibration.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Test water, drain, gas, and liquid-carrying components for leaks. Repair or replace leaking components.
 - 4. Perform hood performance tests required by authorities having jurisdiction.
 - 5. Perform fire-suppression system performance tests required by authorities having jurisdiction.
- C. Prepare test and inspection reports.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial kitchen hoods. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Packaged roof top unit shall have a minimum of a 13 seer rating.
- B. Unit controls.
- C. Roof mounting frame and base.
- D. New sheet metal platform covers.
- E. Galvanized condensate piping and necessary connections.
- F. Rigid pipe gas line and all necessary connections.
- G. All necessary supply and return air connectors.
- H. All necessary electrical connections.
- I. Galvanized transition to existing duct work.
- J. All necessary paperwork for rebate filing process.
- K. Connect to the EMS system.

1.02 REFERENCES:

- A. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- B. ARI 210 - Unitary Air-Conditioning Equipment.
- C. ARI 240 - Air Source Unitary Heat Pump Equipment.
- D. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

1.03 SUBMITTALS:

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Submit shop drawings and product data for manufactured products and assemblies required for this project.
- C. Indicate electrical service and duct connections on shop drawings or product data. Show AGA approval.
- D. Submit manufacturer's installation instructions under provisions of Section 01300.

1.04 OPERATION AND MAINTENANCE DATA:

- A. Submit operation and maintenance data under provisions of Section 01700.
- B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Protect units from physical damage by storing off site until roof mounting frames are in place, ready for immediate installation of units.
- B. Deliver unit to job-site in new, dry, unopened, and well-marked containers showing product and manufacturer's name.
- C. Material handling equipment shall be selected and operated so as not to damage unit or existing construction.
- D. No material may be stored uncovered in the open or in contact with the ground.
- E. Handle unit to prevent damage during transportation and installation.
- F. The Contractor shall assume full responsibility for the protection and safekeeping of products.

1.06 WARRANTY:

- A. Provide five-year manufacturer's warranty.
- B. Warranty: Include coverage of refrigeration compressors, heat exchangers, etc.

1.07 EXTRA MATERIALS:

- A. Provide one set of disposable replacement filters (total of two sets).

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Carrier (Basis of design, all other alternates/substitutions subject to DSA review)
- B. Day & Night.
- C. Payne.
- D. Trane.
- E. York.
- F. Substitutions: Under provisions of Section 012513.01.

2.02 MANUFACTURED UNITS:

- A. Provide roof-mounted units having gas burner, and electric refrigeration.
- B. Unit shall be self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, heat exchanger and burner, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

2.03 FABRICATION:

- A. Cabinet Galvanized steel with baked enamel finish, access doors or removable access panels with quick fasteners screwdriver operated flush cam type. Structural members shall be minimum 18-gauge, with access doors or removable panels of minimum 20-gauge.
- B. Insulation: One-inch thick neoprene coated glass fiber on surfaces where conditioned air is handled. Protect edges from erosion.
- C. Heat Exchangers: Aluminized steel of welded construction.
- D. Supply Fan: Forward curved centrifugal type, resiliently mounted direct drive blower.
- E. Air Filters: One-inch thick glass fiber disposable media.
- F. Roof Mounting Frame: Fourteen inches high galvanized steel, channel frame with gaskets, nailer strips.

2.04 BURNER:

- A. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot. AGA approved.
- B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.
- C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.
- D. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, or adjustable time delay relays with switch for continuous fan operation.

2.05 REFRIGERANT:

- A. Refrigerant mix or blends will not be accepted.

2.06 EVAPORATOR COIL:

- A. Provide copper or aluminum tube aluminum fin coil assembly with galvanized drain pan and connection.
- B. Provide capillary tubes or thermostatic expansion valves for units of six tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

2.07 COMPRESSOR:

- A. Provide hermetic or semi-hermetic compressor, 3600 rev/min maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.
- B. Five-minute timed off circuit shall delay compressor start.
- C. Outdoor thermostat shall be adjustable from 30 degrees to 80 degrees.

2.08 CONDENSER:

- A. Provide copper or aluminum tube aluminum fin coil assembly with sub cooling rows.
- B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor.
- C. Provide refrigerant pressure switches or outdoor thermostat to cycle condenser fans.

2.09 SUPPLY/RETURN CASING:

- A. Outside air or fresh air damper shall be adjustable
- B. Gaskets: Provide tight fitting dampers with edge gaskets, maximum leakage 5 percent at two-inch pressure differential.
- C. Damper Operator: If contract calls for economizer they shall be a pneumatic piston or gear driven type with spring return and pilot positioner.
- D. Mixed Air Controls: Maintain selected supply air temperature and return dampers to minimum position on call for heating and when ambient air temperature exceeds return air temperature.

2.10 PERFORMANCE:

- A. See schedule on drawings for performance characteristics of individual units. Heating and cooling capacities are to be -0% and +20% deviation.
- B. Scheduled performance is based on ARI 210 test conditions. Sound Rating Numbers are in accordance with ARI 270.
- C. Rated cooling capacity is based on 105 degrees F condenser ambient air.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings, or illustrated by the manufacturer.
- B. Verify that proper power supply is available.

3.02 INSTALLATION:

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on factory built roof-mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting frame level.

3.03 MANUFACTURER'S FIELD SERVICES:

- A. Provide initial start-up and shut-down during first year of operation, including routine servicing and check-out.

END OF SECTION

SECTION 26 00 00

GENERAL ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 SECTION INCLUDES

This section includes general requirements specifically applicable to Divisions 26, 27, & 28; including requirements from Division 1.

1.2 RELATED SECTIONS

- A All included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

- A Standards
 - 1 AEIC – Association of Edison Illuminating Companies
 - 2 ANSI – American National Standards Institute
 - 3 ASTM – American Society of Testing and Materials
 - 4 CBM – Certified Ballast Manufacturers Association
 - 5 EIA – Electronic Industry Association
 - 6 ICEA – Insulated Cable Engineers Association
 - 7 IEEE – Institute of Electrical and Electronics Engineers
 - 8 NEMA – The Association of Electrical and Medical Imaging Equipment Manufacturers
 - 9 FM - Factory Mutual
 - 10 UL – Underwriter's Laboratory's, Inc., Standards for Safety
- B Local codes and authorities having jurisdiction
 - 1 City codes
 - 2 County codes
 - 3 Local fire department
- C State codes and authorities having jurisdiction
 - 1 CBC – California Building Code
 - 2 CEC – California Electrical Code
 - 3 State of California Codes
- D National codes and authorities having jurisdiction
 - 1 NESC – National Electrical Safety Code
 - 2 OSHA – Occupational Safety and Health Act
- E Utilities
 - 1 Local cable company
 - 2 Local electrical company
 - 3 Local telephone company
- F Code compliance
 - 1 All work and materials shall comply with the latest rules, codes and regulations, including, but not limited to the following:
 - a Occupational Safety and Health Act Standards (OSHA).

- b CCR, Title 24, Part 3: California Electrical Code (CEC)
- c All other applicable Federal, State and Local laws and regulations.
- 2 Code compliance is mandatory. Nothing in these Drawings and Specifications permits work not conforming to National, State, and Local electrical and building codes. Where work is shown to exceed minimum code requirements, comply with Drawings and Specifications.
- 3 No work shall be concealed until after inspection and approval by proper authorities. If work is concealed without inspection and approval, the Contractor shall be responsible for opening the concealed areas, making any required corrections and/or modifications to his work, and restoring the area to its previous condition.

1.4 DEFINITIONS (APPLICABLE TO DRAWINGS AND SPECIFICATIONS)

- A Provide: To supply, install and connect complete and ready for safe and regular operation of particular work referred to unless specifically otherwise noted.
- B Install: To erect, mount and connect complete with related accessories.
- C Supply: To purchase, procure, acquire and deliver complete with related accessories.
- D Work: Labor, materials, equipment, apparatus, controls, accessories and other items required for proper and complete installation.
- E Wiring: Raceway, fittings, wire, boxes, related items and connection.
- F Concealed: Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.
- G Exposed: Either visible or subject to mechanical or weather damage, indoors or outdoors, including areas such as mechanical and storage rooms. In general, any item that is directly accessible without removing panels, walls, ceiling or other parts of structure.
- H Indicated, Shown, or Noted: As indicated, shown or noted on Drawings or Specifications.
- I Above Grade: Not buried in ground and not embedded in concrete slab on ground.
- J Below Grade: Buried in ground or embedded in concrete slab on ground.
- K Underground: Buried in ground, including under building slabs.
- L Connect: Complete hookup of item with required services, including conduit, wire and other accessories.
- M Furnish: Supply and deliver complete.
- N Similar or Equal: Of base bid manufacturer, equal in materials, weight, size, design, and efficiency of specified product, equivalent to Base Bid Manufacturer's product.
- O Reviewed, Satisfactory, Accepted, or Directed: As reviewed, satisfactory, accepted or directed by or to engineer.
- P Motor Controllers: Manual or magnetic starters (with or without switches), individual pushbuttons, or hand-off-automatic (HOA) switches controlling the operation of motors.
- Q Control Devices: Automatic sensing and switching devices such as thermostats, pressure, float, electro-pneumatic switches and electrodes controlling operation of equipment.
- R Contractor: Electrical Sub Contractor unless stated otherwise.
- S Use (verb): Furnish and install as defined above.

1.5 LICENSES, FEES AND PERMITS

Pay for all City, County or State electrical licenses, fees and permits. Arrange for all required inspections by agencies or authorities having local jurisdiction. The owner shall pay for all inspection fees and permits.

1.6 CONDITIONS AT SITE

- A A visit to the site is required of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.
- B Underground or overhead lines or other services that are damaged as a result of this work shall promptly be repaired at no expense to the Owner and to complete satisfaction of the Owner.

1.7 DRAWINGS AND SPECIFICATIONS

- A All Drawings and all Divisions of these Specifications shall be considered as a whole and work of this Division shown anywhere therein shall be furnished under this Division.
- B The Contract Drawings are diagrammatic and indicate the general arrangement of equipment and wiring. Most direct routing of conduit and wiring is not assured. Exact requirements shall be governed by architectural, structural and mechanical conditions of the job. Consult all other Drawings in preparation of the bid. Extra lengths of wiring or addition of pull or junction boxes, etc., necessitated by such conditions shall be included in the bid. Check all information and report any apparent discrepancies before submitting bid.
- C Right is reserved to make change up to ten (10) feet in location of any outlet, device, or equipment prior to roughing in without increasing contract cost.
- D Equipment and fixtures shall be connected to provide circuit continuity in accordance with applicable codes, whether or not each piece of conductor, conduit or protective device is shown between items of equipment or fixtures and the point of circuit origin.

1.8 SAFETY AND INDEMNITY

- A Safety: The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours.
- B No act, service, Drawing review or construction review by Owner, the Architect, the Engineers or their Consultants, is intended to include review of the adequacy of the Contractor's safety measures, in on or near the construction site.

1.9 RECORD DRAWINGS

- A Submit record Drawings under provisions of Section 013000.
- B Submit prior to final acceptance inspection, one complete marked-up set of reproducible engineering design Drawings.

- 1 Fully illustrate revisions made by crafts in course of work.
 - 2 Include field changes, adjustments, variances, substitutions and deletions, including Change Orders.
 - 3 Indicate exact location of raceways, equipment, and devices.
 - 4 Indicate exact size and location of underground and under floor raceways, grounding conductors, and duct banks.
 - 5 The record Drawings shall show all the work actually constructed and originally shown on the Drawing based upon the field construction by the Contractor.
- C These Drawings shall be for record purposes for Owner's use and are not considered Shop Drawings.

1.10 MANUFACTURER'S INSTRUCTIONS

- A Where the Specifications call for an installation to be made in accordance with manufacturer's recommendations, a copy of such recommendations shall at all times be kept in the job superintendent's office and shall be available to the Owner's representative.
- B Follow manufacturer's instructions where they cover points not specifically indicated on Drawings and Specifications. If they are in conflict with the Drawings and Specifications, obtain clarification from the Architect or Engineer before starting work.
- C One (1) set of equipment manufacturer's Drawings shall be submitted to the Engineer for their record.

1.11 OPERATING AND MAINTENANCE MANUALS

- A Operating and maintenance manuals and close-out documents are used interchangeably
- B Submit operating and maintenance manuals of equipment in the following format. Owner shall decide which format they prefer.
- 1 Three (3) hardcopy sets
 - 2 PDF format
- C For specific requirements, see the sections in which the equipment is specified.

1.12 QUALITY ASSURANCE

- A Provide a meaningful quality assurance program. To assist the Contractor in this program, the Specifications contained herein are set forth as the minimum acceptable requirements. This does not relieve the Contractor from executing other quality assurance measures to obtain a complete operating facility within the scope of this project.
- B The Contractor shall insure that workmanship, materials employed, required equipment and the manner and method of installation conforms to accepted construction and engineering practices, and that each piece of equipment is in satisfactory working condition to satisfactorily perform its functional operation.

1.13 GUARANTEE

Guarantee the installation free from defects of workmanship and materials for a period of one (1) year after Date of Certificate of final payment and promptly remedy any defects developing during this period, without charge.

1.14 BIDDING

- A The contractor shall bid on the plans, specifications, etc. that constitute the contract documents.
- B The contractor shall not attempt to modify the contract documents without the approval of the electrical engineer.
- C All "value engineering" proposals shall be submitted in to the electrical engineer writing.
- D If the contractor makes changes to the contract documents not approved by the electrical engineer, the contractor will still be responsible for installing all devices, conductors, conduits, etc. the contract documents call for.

1.15 ABBREVIATIONS

AIC	Amps interrupting capability
ANSI	American National Standards Institute
ASTM	ASTM International, formerly American Society for Testing and Materials
ATC	Astronomical time clock
CAD	Computer aided design
CATV	Cable television
CBC	California Building Code
CCTV	Closed circuit television
CEC	California Electrical Code
CFC	California Fire Code
CFL	Compact fluorescent lamp
CFR	Code of Federal Regulations
CMC	California Mechanical Code
CPC	California Plumbing Code
CSFM	California State Fire Marshal
DPDT	Double pole, double throw
DPST	Double pole, single throw
DSA	Division of the State Architect
DVR	Digital video recorder
EIA	Electronic Industries Association
EMT	Electrometallic conduit
EOR	Engineer of record
EPA	Effective projected area
FACP	Fire alarm control panel
FMC	Flexible metallic conduit
GRS	Galvanized, rigid steel conduit
HID	High intensity discharge
HPS	High pressure sodium
HVR	Hybrid video recorder
ICC-ES	International Code Council Evaluation Service
IDF	Intermediate data frame
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society of North America

IGBT	Insulated Gate Bipolar Transistor
IMC	Intermediate metallic conduit
IOR	Inspector of record
LAN	Local area network
LCD	Liquid crystal display
LCP	Lighting control panel/lighting relay panel
LED	Light emitting diodes
LRP	Lighting control panel/lighting relay panel
MDF	Main data frame
MH	Metal halide
NEC	National Electrical Code
NEMA	Association of Electrical Equipment and Medical Imaging Manufacturers
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
OCPD	Overcurrent protection device
PDF	Portable document format
PG&E	Pacific Gas and Electric
PQM	Power quality monitor
PTZ	Pan, tilt, zoom
PVC	Polyvinyl chloride
SCCR	Short circuit current rating
SCE	Signal current expander
SPD	Surge protective device
SPDT	Single pole, double throw
SPST	Single pole, single throw
TFT	Thin film transistor
THD	Total harmonic distortion
TIA	Telecommunications Industries Association
TVSS	Transient voltage surge suppression/suppressor
UL	Underwriters' Laboratories
USB	Universal series bus
UPS	Uninterruptable power supply
VFD	Variable frequency drive
VFD	Vacuum fluorescent display
VOIP	Voice over Internet protocol
VPN	Virtual private network
WAN	Wide area network

PART 2 – PRODUCTS

2.1 MATERIAL APPROVAL

- A All materials must be new and bear Underwriters' Laboratories label. Materials that are not covered by UL testing standards shall be tested and approved by an independent testing laboratory or a governmental agency.
- B Material not in accordance with these Specifications may be rejected either before or after installation.
- C Materials or equipment specified by:
 - 1 Name of manufacturer.

- 2 Brand or trade name.
- 3 Catalog reference.

2.2 SUBSTITUTIONS

- A Base the bid on use of materials specified.
- B Equipment other than specified will be considered for approval provided it meets previous items A through C and the following is submitted in writing by the Contractor to the Engineer to allow approval at least 14 days before the bid date:
 - 1 The request for permission to substitute shall be accompanied with a statement of the amount of money to be returned to the contract if the substitution is permitted.
 - 2 Return a completed request for substitution form.
- C The engineer is the sole judge of acceptability of preferred substitutions.
- D If a substitute is permitted, and any re design effort is thereby necessitated, the required re design shall be at the Contractor's expense.

2.3 SUBMITTALS

Submit to architect, or engineer if no architect is involved, seven (7) copies of complete Shop Drawings and materials lists, as noted below, for review within thirty (35) days after award of contract. All proposed deviations from Specifications must be clearly listed and submitted separately under a prominent heading entitled "Substitutions."

- A Fire Alarm Systems
- B Communication Systems
- C Pull Boxes and Cabinets
- D Conduit and Wire
- E Service and distribution
- F Transformers

2.4 OPERATING AND MAINTENANCE MANUALS

Submit Operating and Maintenance Manuals of equipment as specified under Division 1. Verify exact quantity with architect, or engineer if no architect is involved.

2.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A Equipment shall be shipped in its original packages, to prevent damaging or entrance of foreign matter. Handling and shipping shall be performed in accordance with manufacturer's recommendations. Provide protective covering during construction.
- B Replace at no expense to Owner, equipment or material damaged during the storage or handling, as directed by the engineer.
- C Equipment shall be tagged with a weatherproof tag identifying equipment by name and purchase order number. Packing and shipping lists shall be included.

PART 3 – EXECUTION

3.1 CLEARANCE

Minimum code required clearances for electrical equipment shall not be violated.

3.2 WORKMANSHIP AND CONTRACTOR'S QUALIFICATIONS

- A Only quality workmanship will be accepted. Haphazard or poor installation practice will be cause for rejection of work.
- B The Electrical Contractor shall provide a Superintendent in charge of this work at all times to direct the quality of the installation.

3.3 COORDINATION

- A Coordinate work with other trades to avoid conflict and to provide correct rough in and connection for equipment furnished under other trades and requiring electrical connections. Inform Contractors of other trades of the required access to and clearances around electrical equipment to maintain serviceability and code compliance.
- B Verify equipment dimensions and requirements with provisions specified under this Section. Check actual job conditions before fabricating work. Report necessary changes in time to prevent needless work. Changes or additions subject to additional compensation and agreed price shall be at Contractor's risk and expense.
- C Provide temporary feeds and connections to areas and equipment as required to allow phased construction and operation.

3.4 CUTTING AND PATCHING

All cutting and patching required for work of this Division is included herein. Coordination with General Contractor and other trades is imperative. Contractor shall bear the responsibility for and bear the added expense of adjusting for improper holes, supports, etc.

END OF SECTION

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.1 SECTION INCLUDES

Materials, equipment fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction, for the following:

- A Conduit and raceways
- B Wire and cables
- C Outlet boxes
- D Junction boxes
- E Pull boxes
- F Grounding

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

Published specification standards, tests or recommended methods of trade, industry or government organizations apply to work in this section as cited in Section 260000.

- A American Society for Testing and Materials
 - 1 ASTM B3: Standard Specification for Soft or Annealed Copper Wire
 - 2 ASTM B33: Standard Specification for Tin-Coated or Annealed Copper Wire for Electrical Purposes
 - 3 ASTM B738: Standard Specification for Fine-Wire Bunch-Stranded and Rope-Lay Bunch-Stranded Copper Conductors for Use as Electrical Conductors
 - 4 ASTM B355: Standard Specification for Nickel-Coated, Soft or Annealed Copper Wire
 - 5 ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- B California Electrical Code (CEC)
- C Institute of Electrical and Electronic Engineers (IEEE)
 - 1 IEEE 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements

- 2 IEEE 82: Standard Test Procedure for Impulse Voltage Tests on Insulated Conductors
 - 3 IEEE 95: Standard Test Procedure for Impulse Voltage Tests on Insulated Conductors
 - 4 IEEE 141: Recommended Practice for Electric Power Distribution for Industrial Plants
 - 5 IEEE 142: IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems
 - 6 IEEE 241: Recommended Practice for Electric Power Systems in Commercial Buildings
 - 7 IEEE 242: Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)
 - 8 IEEE 399: Recommended Practice for Industrial and Commercial Power Systems Analysis (Brown Book)
 - 9 IEEE 442: Guide for Soil Thermal Resistivity Measurements
 - 10 IEEE 576: Recommended Practice for Installation, Termination, and Testing of Insulated Power Cable as Used in Industrial and Commercial Applications
 - 11 IEEE 1185: Recommended Practice for Cable Installation in Generating Stations and Industrial Facilities
 - 12 IEEE 1584: Guide for Performing Arc Flash Hazard Calculations
 - 13 IEEE 1584a: Guide for Performing Arc-Flash Hazard Calculations--Amendment 1
 - 14 IEEE 1584b: Guide for Performing Arc-Flash Hazard Calculations--Amendment 2: Changes to Clause 4
- D Underwriters' Laboratories
- 1 UL 1: Flexible Metal Conduits
 - 2 UL 4: Armored Cable
 - 3 UL 5: Surface Metal Raceways and Fittings
 - 4 UL 5A: Nonmetallic Surface Raceways and Fittings
 - 5 UL 5B: Standard for Strut-Type Channel Raceways and Fittings
 - 6 UL 5C: Standard for Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits
 - 7 UL 6: Electrical Rigid Metal Conduit – Steel
 - 8 UL 13: Power Limited Circuit Cables
 - 9 UL 83: Thermoplastic Insulated Wires and Cables
 - 10 UL 310: Electrical Quick-connect Terminals
 - 11 UL 360: Liquid Tight Flexible Steel Conduit
 - 12 UL 444: Communications Cables
 - 13 UL 467: Grounding and Bonding Equipment
 - 14 UL 486A: Wire Connectors
 - 15 UL 486B: Wire Connectors
 - 16 UL 486C: Splicing Wire Connectors
 - 17 UL 486D: Sealed Wire Connector Systems
 - 18 UL 486E: Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
 - 19 UL 493: Thermoplastic Insulated Underground Feeder and Branch Circuit Cables
 - 20 UL 510: Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
 - 21 UL 514A: Metallic Outlet Boxes
 - 22 UL 514B: Conduit, Tubing, and Cable Fittings

- 23 UL 514D: Cover Plates for Flush-mounted Wiring Devices
- 24 UL 635: Insulating Bushings
- 25 UL 651: Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
- 26 UL 797: Electrical Metallic Tubing – Steel
- 27 UL 870: Wireways, Auxiliary Gutters, and Associated Fittings
- 28 UL 969: Marking and Labeling Systems
- 29 UL 1063: Machine Tool Wires and Cables
- 30 UL 1242: Standard for Electrical Intermediate Metal Conduit - Steel
- 31 UL 1332: Organic Coatings for Steel Enclosures for Outdoor Use
Electrical Equipment
- 32 UL 1446: Systems of Insulating Materials – General
- 33 UL 1479: Fire Tests of Through Penetration Firestops
- 34 UL 1565: Position Devices (includes cable ties and clamps)
- 35 UL 1581: Reference Standard for Electrical Wires, Cables, and Flexible
Cords
- 36 UL 1652: Flexible Metallic Tubing
- 37 UL 1685: Vertical-tray Fire Propagation and Smoke Release Test for
Electrical and Optical Fiber Cables
- 38 UL 1773: Standard for Termination Boxes
- 39 UL 1977: Component Connectors for Use in Data, Signal, Control, and
Power Applications
- 40 UL 2024: Standard for Signaling, Optical Fiber and Communications
Raceways and Cable Routing Assemblies
- 41 UL 2029: Gas/Vapor Blocked Cable Classified for Use in Class 1
Hazardous (Classified) Locations
- 42 UL 2062: Enclosures for Use in Hazardous (Classified) Locations
- 43 UL 2196: Test for Fire Resistive Cables
- 44 UL 2237: Multi-point Interconnection Power Cable Assemblies for
Industrial Machinery
- 45 UL 2238: Standard for Cable Assemblies and Fittings for Industrial
Control and Signal Distribution
- 46 UL 2239: Hardware for the Support of Conduit, Tubing, and Cable
- 47 UL 2250: Standard for Instrumentation Tray Cable
- 48 UL 2225: Cables and Cable Fittings for Use in Hazardous (Classified)
Locations
- 49 UL 2239: Hardware for the Support of Conduit, Tubing, and Cable
- 50 UL 2256: Nonmetallic Sheathed Cable Interconnects
- 51 UL 2257: Identification Tests for Jacket and Insulation Materials Used in
Plenum Cables
- 52 UL 2459: Insulated Multi-pole Splicing Wire Connectors
- 53 UL 2556: Wire and Cable Test Methods

1.4 QUALITY ASSURANCE

- A Equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.
- B Supply equipment and accessories new, free from defects.
- C Equipment and accessories in compliance with the applicable standards listed in Article 1.3 of this section and with applicable national, state and local codes.
- D Items of a given type shall be the products of the same manufacturer.
- E Deliver, store and protect products under provisions of Section 016000.

- F Ship equipment in its original packages, to prevent damaging or entrance of foreign matter. Perform handling and shipping in accordance with manufacturer's recommendations. Provide protective covering during construction.
- G Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by the engineer.
- H Tag items with a weatherproof tag identifying equipment by name and purchase order number. Include packing and shipping lists.

1.5 SUBMITTALS

- A Submit under provisions of Section 013000 or 013300.
- B Submittals shall include the following:
 - 1 Table of contents
 - 2 A complete set of detailed manufacturer's specifications describing and illustrating all standard and special components and materials
 - 3 Part numbers
 - 4 Evidence of compliance with the applicable standards listed under Article 1.3 of this section
 - 5 Maintenance instructions and intervals
 - 6 Calibration procedures and intervals
 - 7 A complete set of drawings for any special items
 - 8 Wiring diagrams
- C Electronic submittals shall be searchable
- D Seismic Restraint and Anchorage: Provide complete seismic anchorage and bracing for the lateral and vertical support of conduit and electrical equipment in accordance with CBC, Title 24, Part 2, Section 1615A.1 and ASCE 7-05 Section 13.6, and all provisions of this Section.
 - 1 Submit calculations prepared and signed by a Structural Engineer licensed in the State of California, showing compliance with the above for all electrical equipment weighing more than 50 pounds, excepting items corresponding exactly in configuration and weight to those specified and detailed. Where anchorage details are not shown on drawings, the field installation shall be subject to the approval of the Electrical Engineer.
 - 2 All equipment mounted on concrete shall be secured with steel stud expansion anchors requiring a drilled hole. Power driven anchors are not acceptable. Minimum spacing shall be 10 diameter center to center and 5 diameters center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80% of the ICC Evaluation Services research or evaluation report values. Acceptable manufacturers are Hilti, Red Head, and Simpson Strong Tie.
 - 3 Conduit and suspended equipment shall be provided with supports and seismic restraints in accordance with Unistrut, Inc. Seismic Bracing Guide, or Super Strut Inc., Seismic Restraint System guide. Support requirements shall be based upon similar equipment; i.e., water piping as equivalent to conduit with wire fill. A copy of the guide shall be on the job site during construction.
- E The submittal shall be substantially complete for all items and equipment furnished under this section.
- F Individual drawings and data sheets submitted at random intervals will not be accepted for review.

- G Substitutions: Items of same function and performance shall be submitted in conformance with Division 1.

1.6 OPERATION AND MAINTENANCE MANUALS

- A Submit operation and maintenance manuals in accordance with Section 260000.
- B The manuals shall, at minimum, include the following:
- 1 Table of contents
 - 2 Manufacturer (including contact information)
 - 3 Model number
 - 4 Voltage ratings
 - 5 Current ratings
 - 6 List of capabilities
 - 7 Environmental ratings
 - 8 NEMA enclosure type
 - 9 Maintenance instructions and intervals
 - 10 Calibration procedures and intervals
 - 11 Installation instructions
 - 12 Repair instructions (where applicable)
 - 13 As-built drawings
- C Provide manuals in one of the following formats
- 1 Three hardcopies
 - 2 PDF

PART 2 – PRODUCTS

2.1 CONDUIT AND OTHER RACEWAYS

- A Rigid Conduit, also referred to as Galvanized Rigid Steel Conduit (GRS)
- 1 Material: High strength steel
 - 2 Coating
 - a All uses: hot-dipped galvanized
 - b Underground or corrosive areas
 - 1 40-mil, UV stabilized PVC coated
 - 2 Coating shall conform to NEMA RN-1
 - 3 Fittings shall be threaded.
 - 4 Conduit shall be UL-6 listed.
- B Intermediate Metal Conduit (IMC)
- 1 Material: Steel
 - 2 Coating
 - a All uses: hot-dipped galvanized
 - b Underground or corrosive areas
 - 1 40-mil, UV stabilized PVC coated
 - 2 Coating shall conform to NEMA RN-1
 - 3 Conduit shall be UL-1242 listed.
- C Electrical Metallic Tubing (EMT)
- 1 Material: Steel
 - 2 Coating
 - a All uses: hot-dipped galvanized
 - b Underground or corrosive areas

- 1 40-mil, UV stabilized PVC coated
 - 2 Coating shall conform to NEMA RN-1
 - 3 Fittings shall be threaded.
 - 4 Connectors and couplings
 - a Water tight, steel compression type exterior and in wet locations.
Use ETP Fittings InspectoRidge or approved equal when possible.
 - b Steel set screw type in interior, dry locations.
- D Non-metallic conduit
 - 1 Conduit shall be schedule 40 PVC (minimum)
 - 2 Approved for use as non-metallic raceway with 90°C conductors
 - 3 Comply with NEMA TC-2 and NEMA TC-3
- E Flexible Metallic Conduit
 - 1 Material: High strength, hot-dipped galvanized steel
 - 2 Construction: Interlocked
 - 3 Conduits in damp, wet, or corrosive areas shall be liquid tight type with PVC jacket extruded over the steel conduit.
- F Fittings and accessories
 - 1 Fittings and accessories for all conduit types shall be approved for the purpose and equal in all respects to the conduit or raceway.
 - 2 Fittings and accessories for metallic conduits shall be made of ferrous metal and galvanized after fabrication.
- G Pull lines
 - 1 All conduits shall have a minimum of one pull line.
 - 2 Pull line shall be 1/8 inch diameter, yellow color.
 - 3 All pull lines shall be tagged at both ends so as to indicate the length of the conduit run, source, and the destination. (See section 3.3, A, 6).
 - 4 Pull lines shall be Tubbs Cordage "Polyline" or approved equal.
- H Wireways
 - 1 NEMA type
 - a NEMA-1 for dry locations
 - b NEMA-3R or NEMA-4 for damp and wet locations
 - c NEMA-4X for corrosive locations
 - 2 Metal type
 - a Non-corrosive locations: mild steel
 - b Corrosive locations: stainless steel
 - 3 Thicknesses
 - a 6"x6" cross-section and smaller: 16 gauge
 - b 8"x8" cross-section and larger: 14 gauge
 - 4 Finish: The entire enclosure shall be finished as follows:
 - a Degreasing
 - b Cleaning
 - c Phosphatizing
 - d Electrostatic deposition of polymer polyester powder coating followed by baking to produce a hard durable finish.
 - 1 The average thickness of the paint film shall be 2.0 mils.
 - 2 Paint film shall be uniform in color and free from blisters, sags, flaking and peeling
 - e Finish shall conform to UL 50 and UL 50E.
 - f Color shall match surrounding area.
 - 5 Covers
 - a Wireways shall have hinged covers.

- b NEMA 3R, 4 and 4X wireways shall be a gasket on the inside of the cover to seal the wireway when cover is closed.
 - c Covers shall have latches to secure the cover in the closed position.
 - 6 Wireways shall be UL listed.
- I Cable Trays
 - 1 Material: High strength steel
 - 2 Coating
 - a All uses: hot-dipped galvanized
 - b Underground or corrosive areas: 40-mil, UV stabilized PVC coated, coating shall conform to NEMA RN-1
 - 3 Construction
 - a Trays shall be ladder type unless otherwise noted.
 - b Maximum distance between cross-members shall be 12 inches.
 - 4 Trays shall meet NEMA VE-1 standards.
- J Raceways shall be UL listed.

2.2 WIRE AND CABLE

- A Conductors for power and lighting systems 600V or less:
 - 1 Conductors shall be 90°C rated.
 - 2 Conductors size #12 AWG and larger shall be stranded copper.
 - 3 Type:
 - a THWN for wet or underground locations
 - b THHN for dry locations.
 - c 90°C rated
 - 4 Minimum conductor size for voltage drop:
 - a Minimum size #12 AWG for runs 50 feet or less for 208/120V systems or 100 feet or less for 480/277V systems
 - b Increase conductor by one size by one method below:
 - 1 For each additional 50 feet for 208/120V systems or 100 feet for 480/277V systems.
 - 2 Calculate voltage drop and size as directed by CEC Voltage Drop Restrictions.
 - c Underground circuits shall be #8 AWG minimum wire, unless otherwise noted.
 - d Once the contractor has determined conductors' route, calculate the minimum size to meet maximum voltage drop allowed per CEC using $D_{min} = C * L * I / (V_D * N)$.
 - 1 D_{min} is the minimum diameter (circular mills)
 - 2 $C=24$ for copper, $C=39$ for aluminum
 - 3 L is conductor length (feet)
 - 4 I is the current (amps)
 - 5 V_D is the maximum allowable voltage drop (volts)
 - 6 N is the quantity of parallel conductors per phase
 - 5 Minimum size conductors for OCPD shall be determined from CEC Table 310.16 with ampacity corrected for 115°F.
 - 6 Conductor size shall be the largest size to meet maximum voltage drop (2.2 A 4) and to meet CEC ampacity requirements (2.2 A 5).
- B For Signal and Communication Circuits:
 - 1 Special Cables: As specified on Drawings.

- 2 Conductors for general communications use: Stranded copper conductor, #16 AWG minimum, with THWN insulation for underground or wet locations and THHN insulation for dry locations.
- 3 Ends of stranded conductors shall be tinned.

2.3 OUTLET BOXES, JUNCTION BOXES, AND PULL BOXES

- A Above ground locations
 - 1 Outlet Boxes
 - a Hot-dipped galvanized after fabrication
 - b Of required size, minimum 4 inches square, for flush mounted devices and lighting fixtures
 - c Cast type with gasketed covers for outdoor or wet locations.
 - d Device and fixture back boxes shall be 2-1/4" deep, minimum.
 - 2 Junction and Pull Boxes
 - a Use outlet boxes with appropriate covers as junction boxes wherever possible.
 - b Larger junction and pull boxes
 - 1 Sheet steel, hot dipped galvanized after fabrication, finished gray baked enamel
 - 2 Sized according to code
 - 3 Screw-on covers.
- B In-ground pull boxes, handholes, and manholes
 - 1 Precast concrete type with required extension collars.
 - 2 Covers
 - a Lids shall be steel or reinforced concrete, as shown on plans. Pull box lids in traffic areas or large grassy areas subject to mowing by riding mowers shall traffic rated.
 - b Covers shall include hold down bolts.
 - c Top of cover shall be flush with top of box.
 - d Covers shall be identified as ELECTRICAL, SIGNAL, or COMMUNICATIONS unless otherwise specified.
 - 3 Size boxes as indicated on Drawings. If size is not indicated on Drawings, use CEC as a minimum requirement.
 - 4 Boxes shall have 2" thick (minimum), reinforced concrete bottoms with 1" diameter drain hole over 12" of crushed rock.
 - 5 Boxes shall have approved cable supports.
 - 6 Concrete encased stubs for handholes extending five (5) feet beyond handhole.
 - 7 All pull boxes shall be no smaller than a Christy Concrete Products N09.
 - 8 All pull boxes shall be set flush to finished grade and shall have an 8-inch wide by 3-inch thick concrete mow strip poured around it.
 - 9 Manufacturer shall be Brooks Products, Oldcastle Enclosure Solutions (Christy), Jensen Precast, or approved equal.
 - 10 All sections between box, extension rings, etc. and penetrations shall be sealed with mortar.
- C Floor Boxes
 - 1 Provide Walker or equal Modulink non-metallic floor box for concrete areas.
 - 2 Provide quantity of boxes required to accommodate each device.

- 3 Provide Walker Wood Floor Boxes at wood floors provide quantity required to accommodate each device.
- 4 Provide brass flip cover lids.
- D Outlet boxes, junction boxes, pull boxes, etc. recessed in a concrete wall shall be deep masonry boxes.

2.4 CONDUIT AND EQUIPMENT SUPPORTS

- A Conduit supports
 - 1 For Individual conduit runs not directly fastened to the structure: Rod hangers
 - 2 For multiple conduit runs: Trapeze type conduit support designed for maximum loading deflection not exceeding manufacturer's recommendations.
- B Materials
 - 1 All materials not otherwise noted:
 - a Steel with the finished part hot dipped galvanized
 - b Stainless steel for corrosive or damp environments
 - 2 All bolts and nuts shall be stainless steel.
- C Supports anchored to earth shall be anchored in a concrete base per details.
- D Manufacturers shall be Caddy, Unistrut, Powerstrut, or approved equal.
- E All exposed channels shall have end caps made by the channel manufacturer and designed for use with the channel.

2.5 WIRE CONNECTORS

- A For wire size #8 AWG and smaller: Insulated, screw type, rated 105°C, 600V for building wiring and 1000V for fixtures; Scotchlok, Ideal, or approved equal.
- B For wire size #6 AWG and larger: T&B or approved equal screw type with 3M "#33+" or Plymouth "Slipknot Gray" tape insulation.
- C Underground wire splices
 - 1 Connect ends of conductors with copper compression connectors, 3M Scotchlok or approved equal.
 - 2 Seal splice with inline resin splice kit approved for weather exposure, direct burial, and wet location; 3M Scotchcast or approved equal.
- D Only set screw, compression type connectors may be used for MC cables. Fish hook/open tang connectors are prohibited.

2.6 GROUNDING

- A Ground Rods
 - 1 3/4 inch diameter
 - 2 Copper weld type
 - 3 10 feet in length.
- B Ground Wire: Conductors shall be medium-hard drawn, copper, and stranded, with sizes as shown on drawings.
- C Utilize CADWELD Multi-System Exothermic Welding for below grade ground connections.
- D Bolts, nuts, and washers shall be bronze, cadmium plated steel, or other corrosion resistant material approved for the purpose.

2.7 MISCELLANEOUS MATERIALS

- A All screws, bolts, nuts, and washers on equipment outdoors or in wet or corrosive environments shall be stainless steel.

2.8 SEALANTS

- A General purpose sealant: One part polysulfide or polyurethane, Federal Standard TT-S-00230c or two-part polyurethane, Federal Standard TT-SS-227E of Mameco Vulkem 116 or 227 or approved equal product manufactured by Products Research and Chemical Corporation. Pecora, Sika, Sonneborn, or Tremco may be substituted under provisions of Section 016000.
- B Conduit sealant
 - 1 Two part, self curing urethane
 - 2 Non-sagging
 - 3 Liquid and gas tight
 - 4 Chemically stable once cured
 - 5 Compatible with conduit and conductor materials
 - 6 Designed for use as conduit seal
- C Fire retardant sealant: Dow Corning Company, Type 3-6548 silicone RTV foam sealant, closed cell, 18 lb. density, 2-part system with UL certification. Type 96-081 one-part sealant shall be used for small spaces and cracks. 3M Fire Barrier Caulk CP25 is also acceptable.

2.9 IDENTIFICATION

- A Nameplates:
 - 1 White, acrylic plastic suitable for indoor or outdoor use
 - 2 Face colored as below with engraved, white, 3/16" minimum, Arial or similar font characters
 - a Equipment on normal systems: Black face
 - b Equipment on emergency systems: Red face
 - 3 Clear plastic overlay suitable for indoor or outdoor use that can be replaced if vandalized.
 - 4 Sign shall include device name, voltage, and size.
 - 5 Outdoor nameplates shall be UV stable and fade resistant.
- B Pull line identification tags:
 - 1 Aluminum plate
 - 2 1/8" tall (minimum), Arial (or similar) font, identifying text stamped on plate
 - 3 Tags shall describing conduit's length, source, and destination.

PART 3 – EXECUTION

3.1 GENERAL

- A Electric system layouts indicated on the Drawings are generally diagrammatic, but shall be followed as closely as actual construction and work of other trades will permit. Govern exact routing of cable and wiring and the locations of outlets by the structure and equipment served. Dimensions shall be taken from Architectural Drawings.

- B Consult all other Drawings. Verify scales and report any dimensional discrepancies or other conflicts to architect, or engineer if no architect is involved, before submitting bid.
- C Home runs to panelboards are indicated as starting from the outlet nearest the panel and continuing in the general direction of that panel. Continue such circuits to the panel as though the routes were completely indicated. Terminate homeruns of signal, alarm, and communications system in a similar manner.
- D Avoid cutting and boring holes through structure or structural members wherever possible. Obtain prior approval of Architect and conform to structural requirements when cutting or boring the structure is necessary or permitted.
- E Furnish and install necessary hardware, hangers, blocking, brackets, bracing, runners, required for equipment specified under this section.
- F Provide necessary backing required to insure rigid mounting of outlet boxes.
- G Install pull line in all conduits to remain that will have their conductors removed.

3.2 INSTALLATION OF CONDUIT

- A Run conduit concealed unless otherwise noted or shown on Drawings.
- B Run exposed conduit parallel to or at right angles to center lines of columns and beams.
- C Run no conduit in concrete slabs or floors except at point of penetration. Penetrations shall be at right angles to slab surfaces.
- D Install conduit above ceilings to avoid obstructing removal of ceiling tiles, lighting fixtures, air diffusers, etc.
- E Conduit shall not cross any duct shaft or area designated as future duct shaft. Coordinated with mechanical work to avoid any conflict.
- F Install pull line in empty conduit installed under this contract. Provide and install labels as describe in "Identification" sub-section.
- G Spare conduits shall be capped to prevent intrusion of moisture and foreign objects.
- H Minimum conduit size shall be 1/2 inches when installed above ground and 3/4 inches when installed underground or under building slabs. Increase conduit size as required for wiring. Size for conduit, unless specifically shown otherwise, shall be determined from Table 3 for all conductors, Chapter 9 of latest National Electric Code.
- I Conduit shall be rigid conduit, IMC, EMT, or plastic as follows:
 - 1 Above ground and dry locations: Use rigid conduit, IMC or EMT.
 - a Wet locations: Rigid conduit, IMC.
 - b Locations subject to mechanical injury: Rigid conduit or IMC only.
 - c In concrete walls or block walls: Rigid steel conduit or IMC only.
 - d Dry locations and not subject to mechanical injury: EMT (interior locations only), IMC, or rigid conduit.
 - 2 Underground: Use wrapped rigid steel or plastic.
 - a Schedule 40 PVC: For use underground where protected by concrete slabs, asphaltic pavement, or concrete walkways. Use steel elbows for plastic conduit runs penetrating floor slabs. Bends in plastic conduit other than normal long sweeps shall be made only with factory formed ells or curved segments. Heat bending may not be used. Sections of rigid steel conduit runs are require where direction changes. In all cases where use of plastic

- conduit is allowed or specified, Contractor may, at his option, use rigid steel conduit.
 - b Underground conduits shall have red 4" wide identifying caution tape reading "CAUTION ELECTRICAL LINE BELOW", length as required and installed 12" above all conduits runs.
 - c Do not install plastic conduit in rock base.
 - d Underground conduit entering building shall be provided with one (1) 10 foot section of rigid steel conduit at point of penetration of foundation, footing or basement wall, with approximately equal lengths inside and outside building line, unless otherwise noted.
- 3 Bends
 - a Make risers to grade with rigid steel long radius sweep conduit and rigid steel elbow fittings only.
 - b Minimum radius of sweeps shall be 24 inches.
- J Burial depth of conduit shall be as follows:
 - 1 Concrete encased: 24 inch minimum for 600V or lower systems to top of concrete encasement.
 - 2 Conduit without concrete encasement or cap: 24 inch minimum to top of conduit.
 - 3 When installed under buildings, the above minimum depth shall be 18 inches below bottom of floor slab.
- K Use flexible steel conduit in the following applications:
 - 1 Recessed lighting fixtures.
 - 2 Motor connections.
 - 3 Connection between fan plenum and structure.
 - 4 At expansion joints.
 - 5 At transformers and other equipment which produce vibration.
- L Provide junction boxes/pull boxes as required to limit any power system conduit run to a maximum of four (4) 90 degree bends (two (2) 90 degree bends for signal communication system conduit runs) or to avoid "U" bends.
- M Conduit Supports:
 - 1 Support conduit with Underwriters' Laboratories listed conduit support intervals required by the California Electric Code.
 - 2 Wire or sheet metal strips are not acceptable for conduit not directly fastened to structure or for multiple conduit runs.
 - 3 Individual conduit 1/2 inch and 3/4 inch size may be supported from ceiling support wire with Caddy clips only if acceptable to local code. Only one conduit is permitted to be attached to any ceiling support wire. Hang such conduit so as not to affect level of ceiling.
 - 4 Avoid attaching conduit to fan plenums. When it is necessary to support conduit from fan plenum, provide a length of flexible conduit between the section attached to the fan plenum and other sections. Provide a length of flexible conduit between the portion attached to the building to minimize transmission of vibration to the building structure.
- N Conduit penetration of roof, walls, floors and ceilings shall be sealed to preserve the integrity of waterproofing, fire rating and soundproofing for which the roof, wall, floor or ceiling is designed. Materials and methods used shall conform to that specified under Architectural sections.
- O Underground conduit and ducts 2 inches and larger shall be proven clear by pulling through a mandrel 1/4 inch smaller than the inside diameter.

- P Where flush branch circuit panelboards or terminal cabinets are shown on walls, stub a minimum of four (4) 1 inch empty conduit into overhead ceiling spaces and four (4) 1 inch empty conduit into space below floor (if any) in addition to conduit required for circuit wiring.
- Q Paint all exposed conduit to match its surroundings.
- R Plastic conduits exposed to sun light shall be UV stabilized.
- S Where rigid steel conduit runs in direct contact with the earth, conduit shall be wrapped with 10-mil PVC tape to form 40 mil of protection, or shall have factory applied PVC coating.
- T Label all conduits at each terminus, pull box, and junction box.

3.3 INSTALLATION OF WIRE

- A Install all wiring in raceway unless specifically shown or noted otherwise.
- B Pull no wire into any portion of the conduit system until construction work which may damage the wire has been completed.
- C Install wire continuous from outlet to outlet or terminal to terminal. Splices in cables when required shall be made in handholes, pull boxes or junction boxes. Make branch circuit splices in outlet boxes with 8 inches of correctly color-coded tails left in the box.
- D Make splices in wires and cables utilizing specified materials and methods.
- E Cables and wires passing through handholes shall be full looped inside the handhole (360 degree) and supported on galvanized steel racks, beginning 10" above the bottom of the handhole. Leave handhole in clean condition with debris removed.
- F Make ground, neutral, and line connections to receptacle and wiring device terminals as recommended by manufacturer. Provide ground jumper from outlet box to ground terminal of devices when the device is not approved for grounding through the mounting screws.
- G Provide Brady wire markers where number of conductors in a box exceed four (4).
- H Wiring shall be tested for continuity (600V and below). All systems shall be entirely free from grounds, short circuits, and any or all defects.
- I Measure and record the insulation resistance of 600 volt insulated conductors size #4/0 AWG and larger using a 500 volt megger for one minute. Make tests with circuits isolated from source and load.
- J All conductor bends must have a radius greater than or equal to the manufacturer's listed bending radius.
- K Label all conductors at each terminus, pull box, and junction box.

3.4 WIRE COLOR CODE

- A Color code conductors. Wire sized #8 AWG and smaller shall have integral color coded insulation. Wire sizes #6 AWG and larger may have black insulation but shall be identified by color coded electrical tape at junction, splice, pull and termination points. Apply color tape with 1/2 lap to at least 6 inches of the conductor.
- B Color code wire as follows:

Conductors	208/120V	480/277V
Phase A	Black	Brown
Phase B	Red	Orange

Phase C	Blue	Yellow
Neutral	White	White or Gray (consistent throughout facility)
Ground	Green	Green

3.5 CONNECTIONS TO EQUIPMENT

A General:

- 1 Furnish and install required power supply conduit and wiring to equipment. See below for other wiring required.
- 2 Furnish and install a disconnect switch immediately ahead of and adjacent to each magnetic motor starter or appliance unless the motor or appliance is located adjacent to and within sight of the serving panelboard, circuit breaker or switch. Verify equipment nameplate current ratings prior to installation.
- 3 Mount motor starters including those furnished under other sections or specifications, and provide power wiring to them.
- 4 Install rough-in work for equipment from approved shop drawings to suit the specific requirements of the equipment.
- 5 Furnish and install magnetic motor starters that are shown on the Drawings or specified under other divisions to be furnished under this division of work. Verify equipment nameplate ratings prior to installation and furnish adequately rated starters for the loads.
- 6 Furnish and install manual thermal protection for motors not integrally equipped with thermal protection.
- 7 Furnish and install 120V power to each control panel and time switch requiring a source of power to operate.

B Heating, ventilating, and air conditioning equipment:

- 1 Coordinate with mechanical contractor for sizes, locations and details of motors, heating units, and control requirements.
- 2 Provide required power supply conduit and wiring to equipment.
- 3 Provide a suitable means of disconnect switch immediately ahead of and adjacent to each motor and appliance unless the motor or appliance is located adjacent and within sight of the service panelboard, circuit breaker or switch at a distance allowed by codes. Verify equipment nameplate current ratings prior to installation. Provide a disconnect means at each magnetic motor starter.
- 4 Provide magnetic motor starters required under this division of work.
- 5 Provide manual thermal protection for motors not integrally equipped with thermal protection.
- 6 Line and low voltage temperature control and interlock wiring, conduit, and required connections are a part of other divisions unless specifically shown or noted on the Drawings as to be furnished under this section.
- 7 Provide 120V power supply to control panels, time switch furnished and installed under other divisions of work.
- 8 Furnish and install 120V power to each duct detector scheduled for operation of fire dampers or shut down of mechanical equipment. Coordinate the exact quantity and locations with the mechanical drawings.

C Plumbing and other contractor-furnished and Owner-furnished equipment:

- 1 Required power and control conduit, wiring and connections are included under this section of the work. Control sensing and alarm devices will be

furnished under the respective section of the contract supplying the equipment unless noted otherwise. These devices will be located in pipes, ducts, vessels, tanks, etc., and will be mounted in a place by the Contractor furnishing the devices. Other devices shall be mounted under this section of the work.

- 2 Control panels for packaged equipment will be furnished under the respective section of the contract supplying the equipment unless otherwise noted. Installation and connection of the control panels are under this section of the work.

3.6 SYSTEM NEUTRAL GROUND

- A Ground the neutral conductor of each transformer to limit the maximum potential above ground due to normal operating voltage and limit the voltage level due to abnormal conditions.
- B Ground transformers with secondary voltage 600V class or less as follows: 3 phase, 4 wire wye connected: ground neutral point.
- C For transformers 75kVA size or lower with primary voltage 480V or lower, the primary equipment ground conductor may be used for grounding the secondary neutral provided it is adequately sized in accordance with CEC system ground conductor size.

3.7 EQUIPMENT GROUND

- A Ground non-current carrying metal parts of electrical equipment enclosures, frames, or conductor raceways to provide a low impedance path for line to ground fault current and to bond all non current carrying metal parts together. Install a ground conductor in each raceway system. Equipment ground conductor shall be electrically and mechanically continuous from the electrical circuit source to the equipment to be grounded. Size ground conductors per CEC 250.95 unless otherwise shown on drawings.
- B Grounding conductors shall be identified with green insulation. Where green insulation is not available, on larger sizes, black insulation shall be used and suitably identified with green tape at each junction box or enclosure device.
- C Install metal raceway couplings, fittings and terminations secure and tight to insure good ground continuity. Provide grounding bushing and bonding jumper where metal raceway is not directly attached to equipment metal enclosure and at concentric knockouts.
- D Lighting fixtures shall be securely connected to equipment ground conductors. Outdoor lighting standards shall have a factory installed ground for terminating the ground wire.
- E Motors shall be connected to equipment ground conductors with a conduit grounding bushing and with a bolted solderless lug connection on the metal frame.

3.8 STRUCTURAL GROUND

- A Concrete encased electrode shall be 2 inches above the bottom of concrete footing where shown on drawings. See drawings for details.

- B Domestic, chilled and hot water mains and fire protection metallic water pipes shall be connected to the ground bus with #4/0 AWG bare copper conductor at a minimum of two points.
- C Miscellaneous metal objects including piping, vessels and structural shapes within six feet of metallic objects connected to the ground system and which are not interconnected mechanically with the grounding system, shall be interconnected with a minimum #6 AWG bare copper conductor.

3.9 IDENTIFICATION

- A Provide and install nameplates on all switchboards, distribution boards, panels, motor starters, VFDs, transformers, safety switches/disconnects, push buttons, selector switches, pilot lights, and other similar devices. Fasten nameplates to equipment with one sheet metal screw at each corner.
- B Provide and install labels on lighting switches and convenience and special purpose receptacles to show panel and circuit number to which the device is connected.
- C Provide and install identification tags on all conduit pull.
- D Provide label meeting ANSI Z535 standards on motors reading:

WARNING

**AUTOMATIC EQUIPMENT
MAY START AT ANY TIME**

3.10 CIRCUIT BREAKER ELECTRICAL COORDINATION STUDY

- A Contractor shall provide a coordination study to determine trip settings of circuit breakers.

3.11 ARC FLASH STUDY

- A Contractor shall provide a study to determine potential arc flash energy.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 – GENERAL

1.1 SECTION INCLUDES

Materials, equipment fabrication, installation, and tests in conformity with equipment applicable to this project, applicable codes and authorities having jurisdiction, for grounding

1.2 RELATED SECTIONS

- A All included sections under Division 1
- B All included sections under Division 26
- C Plans
- D Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS

Published specifications standards, tests or recommended methods of trade, industry or government organizations apply to work in this section as cited in Section 16000.

1.4 QUALITY ASSURANCE

- A Equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.
- B Supply equipment and accessories new, free from defects.
- C Supply equipment and accessories in compliance with the applicable standards listed in Article 1.3 of this section and with applicable national, state and local codes.
- D Items of a given type shall be the products of the same manufacturer.

1.5 SUBMITTALS

- A Submit under provisions of Section 01330. Provide detailed description of items supplied, including specifications, performance characteristics, materials, wiring diagrams and schedules.
 - 1 Submit evidence that products satisfy seismic requirements for the State of California.
 - 2 Submit evidence of compliance with the applicable standards listed under Article 1.3 of this section.
- B Manufacturer's Instructions: Submit manufacturer's installation instructions.
- C Product Data: Submit manufacturer's descriptive literature.
- D Shop Drawings: Submit complete fabrication details, elevations and sections of switchboard, dimensions, space available for conduit, rating, short circuit withstand ability of bus and lowest rated device, circuit schedule showing circuit number, device description, device frame ampere rating and trip, fuse clip ampere rating, termination lug size, feeder and circuit identification, conductor ratings and one-line and wiring diagrams. Include both elementary diagram and terminal to terminal wiring diagrams.
- E Substitutions: Items of same function and performance shall be in conformance with Division 1.

- F Submit field test and operations check report for circuit breakers and motor starters under provisions of Section 16080.

1.6 OPERATION AND MAINTENANCE DATA

- A Submit operation instructions, maintenance and repair data under provisions of Division 1.
- B Ship equipment in its original packages to prevent damaging or entrance of foreign matter. Perform handling and shipping in accordance with manufacturer's recommendations. Provide protective covering during construction.
- C Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by the engineer.
- D Tag items with a weatherproof tag identifying equipment by name and purchase order number. Include packing and shipping lists.

PART 2 – PRODUCTS

2.1 GROUND RODS

Ground rods shall be:

- A. 3/4 inch diameter
- B. Copper weld type
- C. 10 feet in length.
- D. Ground rings

2.2 BARE COPPER GROUND WIRE

Conductors shall be medium-hard drawn, copper, and stranded, with sizes as shown on drawings.

2.3 BELOW GRADE GROUND CONNECTIONS

Utilize CADWELD Multi-System Exothermic Welding.

2.4 HARDWARE

Bolts, nuts and washers shall be bronze, cadmium plated steel, or other non-corrosive material, approved for the purpose.

PART 3 – EXECUTION

3.1 SYSTEM NEUTRAL GROUND

- A Ground the neutral conductor of each transformer to limit the maximum potential above ground due to normal operating voltage and limit the voltage level due to abnormal conditions.
- B Ground transformers with secondary voltage 600V class or less as follows:
3-phase, 4-wire wye connected: ground neutral point.
- C For transformers 75kVA size or lower with primary voltage 480V or lower, the primary equipment ground conductor may be used for grounding the secondary

neutral provided it is adequately sized in accordance with CEC system ground conductor size.

3.2 EQUIPMENT GROUND

- A Ground non-current carrying metal parts of electrical equipment enclosures, frames, or conductor raceways, structural metal supports for the mechanical and plumbing equipment to provide a low impedance path for line-to-ground fault current and to bond all non-current carrying metal parts together. Install a ground conductor in each raceway system. Equipment ground conductor shall be electrically and mechanically continuous from the electrical circuit source to the equipment to be grounded. Size ground conductors per CEC 250-95 unless otherwise shown on drawings.
- B Grounding conductors shall be identified with green insulation. Where green insulation is not available, on larger sizes, black insulation shall be used and suitably identified with green tape at each junction box or enclosure device.
- C Install metal raceway couplings, fittings and terminations secure and tight to insure good ground continuity. Provide grounding bushing and bonding jumper where metal raceway is not directly attached to equipment metal enclosure and at concentric knockouts.
- D Lighting fixtures shall be securely connected to equipment ground conductors. Outdoor lighting standards shall have a factory installed ground for terminating the ground wire.
- E Motors shall be connected to equipment ground conductors with a conduit grounding bushing and with a bolted solderless lug connection on the metal frame.

3.3 STRUCTURAL GROUND

- A Concrete encased electrode shall be 2 inches above the bottom of concrete footing where shown on drawings. See drawings for details.
- B Domestic, chilled and hot water mains and fire protection metallic water pipes shall be connected to the ground bus with #3/0 AWG bare copper conductor at a minimum of two points.
- C Miscellaneous metal objects including piping, vessels and structural shapes within six feet of metallic objects connected to the ground system and which are not interconnected mechanically with the grounding system, shall be interconnected with a minimum #3/0 AWG bare copper conductor.

3.4 GROUND RESISTANCE TEST

- A Building ground electrode resistance testing shall be accomplished with a ground resistance, direct reading, single test meter utilizing the Fall-of-Potential method and two (2) referenced electrodes. Perform test prior to interconnection to other grounding system. Orient the concrete encased ground electrode to be tested and the two referenced electrodes in straight line spaces fifty (50) feet apart. Drive the two (2) reference electrodes ten (10) feet deep.
- B Test results shall be in writing, and shall show temperature, humidity and condition of the soil at the time of the tests. In the case where the ground resistance exceeds 25 ohms, add an additional ground rod and retest. Add additional ground rods when necessary in order to bring the ground resistance

below 25 Ohms. All testing shall be done prior to concrete pour and in the presence of the inspector of record. Provide test results for engineer review.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Hangers and supports for electrical equipment and systems.
- B. Construction requirements for concrete bases.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

- A Published specifications standards, tests or recommended methods of trade, industry or government organizations apply to work in this section as cited in Section 260000.
- B American Society for Testing and Materials (ASTM)
 - 1 ASTM A36/A36M: Standard Specification for Carbon Structural Steel
 - 2 ASTM A167: Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - 3 ASTM A276: Standard Specification for Stainless Steel Bars and Shapes
 - 4 ASTM A325: Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum Tensile Strength
 - 5 ASTM A563: Standard Specification for Carbon and Alloy Steel Nuts
 - 6 ASTM B221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - 7 ASTM B632: Standard Specification for Aluminum-Alloy Rolled Tread Plate
 - 8 ASTM B633: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
 - 9 ASTM E488: Standard Test Methods for Strength of Anchors in Concrete Elements
 - 10 ASTM F594: Standard Specification for Stainless Steel Nuts
- C American Welding Society (AWS)
 - 1 AWS D1.1: Structural Welding Code - Steel
- D California Building Safety Codes (CBSC)
 - 1 California Building Code (CBC)
 - 2 California Electrical Code (CEC)
- E General Services Administration

- 1 FF-S-325
- 2 W-C-582: Conduit, Raceway, Metal and Fittings: Surface
- 3 WW-H-171: Hanger and Support, Pipe
- F ICC Evaluation Service (ICC-ES)
 - 1 ESR-1917
- G Manufacturers Standardization Society (MSS)
 - 1 MSS SP-58: Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation
 - 2 MSS SP-69: Pipe Hangers and Supports – Selection and Application
- H Metal Framing Manufacturers' Association
 - 1 MFMA-4: Metal Framing Standard Publication
 - 2 MFMA-101: Guidelines for the Use of Metal Framing
- I National Electrical Contractors Association
 - 1 NECA 1: Standard Practice of Good Workmanship in Electrical Construction
 - 2 NECA 101: Standard for Installing Steel Conduits (Rigid, IMC, EMT)
- J Underwriters' Laboratories
 - 1 UL 2239: Hardware for the Support of Conduit, Tubing, and Cable

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with latest editions of the California Building Code and California Electric Code

1.5 SUBMITTALS

- A. Submit under provisions of Section 013000 or 013300.
- B. Submittals shall include the following:
 - 1. Table of contents
 - 2. A complete set of detailed manufacturer's specifications describing and illustrating all standard and special components and materials
 - 3. Part numbers
 - 4. Evidence of compliance with the applicable standards listed under Article 1.3 of this section
 - 5. Maintenance instructions and intervals
 - 6. A complete set of drawings for any special items
- C. Electronic submittals shall be searchable
- D. Shop drawings shall be stamped and signed by a licensed structural engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers: include product data for components
 - 2. Steel slotted channel systems: include product data for components
 - 3. Equipment supports
- E. Welding certificates
- F. The submittal shall be substantially complete for all items and equipment furnished under this section.
- G. Individual drawings and data sheets submitted at random intervals will not be accepted for review.
- H. Substitutions: Items of same function and performance shall be submitted in conformance with Division 1.

1.6 OPERATION AND MAINTENANCE MANUALS

- A Submit manuals at close out.
- B The manuals shall, at minimum, include the following:
 - 1 Manufacturer (including contact information)
 - 2 Model number
 - 3 Load ratings
 - 4 Material type(s)
 - 5 Environmental ratings
 - 6 Maintenance requirements
 - 7 Installation instructions
 - 8 Repair instructions (where applicable)
- C Provide manuals in one of the following formats
 - 1 Three hardcopies
 - 2 PDF

1.7 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

PART 2 – PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems
 - 1. Comply with MFMA-4, factory-fabricated components for field assembly.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings:
 - a. PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - b. Minimum thickness shall be 40 mils.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
 - 6. Manufacturers:
 - a. Cooper B-Line, Inc.
 - b. ERICO International Corporation
 - c. Hilti Corporation
 - d. Thomas & Betts Corporation

- e. Unistrut
 - f. Approved equal
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored 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 malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components:
 - 1. General:
 - a. Anchors shall be steel with corrosion resistant, durable coating or stainless steel
 - b. Select anchors with strength required for anchor and as tested according to ASTM E488.
 - c. Minimum length shall be eight times diameter.
 - d. Tension, shear, and pullout capacities shall be appropriate for supported loads and building materials used
 - e. Post installed anchors must be listed in a current evaluation report issued by one of the following:
 - 1. International Code Council Evaluation Service (ICC-ES)
(<http://www.icc-es.org/reports/index.cfm?search=search>)
 - 2. City of Los Angeles Research Report
 - 2. Powder-Actuated Fasteners:
 - a. Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood
 - b. Manufacturers:
 - 1. Hilti Corporation
 - 2. Simpson Strong-Tie Co., Inc.
 - 3. Approved equal
 - 3. Mechanical-Expansion Anchors:
 - a. Insert-wedge-type, stainless steel, for use in hardened portland cement
 - b. Anchors shall meet the descriptive part of Federal Specifications FF-S-325 Group II, Type 2, Class 2, Style 1.
 - c. Anchors shall be equivalent to Hilti Kwik-Bolt TZ2.
 - 4. Concrete inserts shall be steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58
 - 5. Clamps for attachment to steel structural elements: MSS SP-58, type suitable for attached structural element
 - 6. Through bolts shall be structural type, hex head, high strength and comply with ASTM A325
 - 7. Toggle Bolts: All-steel springhead type
 - 8. Hanger Rods: Threaded steel

2.2 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:
 - 1. Comply with requirements with ASTM A36 (ferrous metals), ASTM A167 and ASTM A276 (stainless steel), and ASTM B221 and B632 (aluminum) for shapes and plates.
 - 2. Hot dipped galvanized steel
 - 3. Stainless steel for corrosive areas

2.3 CONCRETE BASES

- A. Concrete Pad
 - 1. Concrete shall have strength of 3000 PSI within 28 days.
 - 2. The pad shall be large enough to achieve the following:
 - a. Edge of anchor bolt holes shall be a minimum of 10 times the bolt diameter from edge of pad.
 - b. Edge of equipment shall be a minimum of 8 inches from edge.
 - 3. Minimum thickness shall be 12 inches with 3 inch deep by 12 inch wide footing around perimeter
 - 4. Bottom of footings shall be a minimum of 8" below finished grade.
 - 5. Pad shall include #4 rebar at 10 inch intervals in both x direction and y direction.
- B. Concrete Pole Bases: Refer to Typical Details

PART 3 – EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by California Electrical Code. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables:
 - 1. Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 2. Secure raceways and cables to these supports with two-bolt conduit clamps
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) 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, as permitted in California Electric Code.
- 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 (890 N).
- 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. Wood framing: Fasten with lag screws or through bolts.
 - 2. Light gauge steel framing: self tapping screws
 - 3. Steel beams: beam clamps
 - 4. Concrete: expansion fasteners

3.3 CONDUIT SUPPORTS

- A Conduit supports
 - 1 For Individual conduit runs not directly fastened to the structure: Rod hangers
 - 2 For multiple conduit runs: Trapeze type conduit support designed for maximum loading deflection not exceeding manufacturer's recommendations.
 - 3 Wire or sheet metal strips are not acceptable for conduit not directly fastened to structure or for multiple conduit runs.
- B Support conduit with Underwriters' Laboratories listed conduit support intervals required by the California Electric Code.
- C Individual conduit 1/2 inch and 3/4 inch size may be supported from ceiling support wire with Caddy clips only if acceptable to local code. Only one conduit is permitted to be attached to any ceiling support wire. Hang such conduit so as not to affect level of ceiling.
- D Avoid attaching conduit to fan plenums. When it is necessary to support conduit from fan plenum, provide a length of flexible conduit between the section attached to the fan plenum and other sections. Provide a length of flexible conduit between the portion attached to the building and the rest of the conduit run to minimize transmission of vibration to the building structure.
- E Supports anchored to earth shall be anchored in a concrete base per details.

3.4 INSTALLATION OF POST-INSTALLED ANCHORS

- A. Minimum distances
 - 1. Bolt hole edge to edge of concrete: 10 times bolt diameter
 - 2. Bolt center to bolt center: 12 times bolt diameter
- B. Expansion type anchors
 - 1. Anchor shall be installed and torque per manufacturer's recommendations.
 - 2. Setting verification:
 - a. Torque-controlled anchors: Following attainment of 10% of the required torque, torque-controlled anchors shall not require more than six (6) additional complete turns of the nut during installation to achieve the manufacturer's specified installation torque. The extent

- of bolt projection after installation shall be measured to confirm that this requirement has been met.
- b. Displacement-controlled anchors: The position of the plug in the anchor shell shall be checked with the manufacturer-supplied installation tool or other appropriate device. The position of the plug shall conform to the manufacturer's specifications.
3. Allowable loads
- a. Anchors not installed in underside of beam/slab:
 - 1. When tested in accordance with AC01, Section 5.6: Values listed in ICC-ES report
 - 2. When not tested in accordance with AC01, Section 5.6: 80% of values listed in ICC-ES report
 - b. Anchors installed in underside of beam/slab:
 - 1. When tested in accordance with AC01, Section 5.6: Values for anchor without special inspection or in cracked concrete in ICC-ES report
 - 2. When not tested in accordance with AC01, Section 5.6: 80% of values for anchor without special inspection or in cracked concrete in ICC-ES report
- C. Epoxy-type (adhesive) Anchors
- 1. Allowable loads: values from ICC-ES report when compliant with AC58.
- D. Anchors must receive special inspection per CBC Section 1704.15.

3.5 TESTING AND INSPECTION OF POST-INSTALLED ANCHORS

- A. General
- 1. Post-installed anchors shall be tested in accordance with the provisions of 2019 California Building Code Section 1910A.5, by an authority having jurisdiction accepted testing facility, unless approval of an alternative individual is obtained in advance from the authority having jurisdiction.
 - 2. If any anchor fails testing, test all anchors of the same type, not previously tested until twenty (20) consecutive anchors pass, then resume the initial test frequency. If the anchors are used for the support and bracing of non-structural components (pipe, duct or conduit), the twenty (20) shall be only those anchors installed by the same trade.
 - 3. Test equipment (including torque wrenches) is to be calibrated by an approved testing laboratory in accordance with standard recognized procedures.
 - 4. Regardless of which test method is chosen, test values and all appropriate criteria shall be shown on the contract documents.
 - 5. Anchor diameter refers to the thread size for the wedge and sleeve categories, and to the anchor outside diameter for the sleeve category.
 - 6. Apply proof test loads to wedge and sleeve anchors without removing the nut if possible. If not, remove nut and install a threaded coupler to the same tightness as the original nut using a torque wrench to apply the test load.
 - 7. For sleeve/shell internally threaded categories, verify that the anchor is not prevented from withdrawing by a baseplate or other fixtures. If restraint is found, loosen and shim or remove fixture(s) prior to testing.

8. Reaction loads from test fixtures may be applied close to the anchor being tested, provided the anchor is not restrained from withdrawing by the fixture(s).
9. Alternate torque test procedures and test values for shell type anchors may be submitted to the enforcement agency for review and approval on a case-by-case basis when test procedures are submitted and approved by the enforcement agency.
10. Required test loads may be determined by either of the following methods:
 - a. Twice the allowable tension load from Part 3.4.
 - b. Tension or torque test values from the table and procedures.

Test Values (Hardrock or Lightweight Concrete)							
Anchor	Wedge		Sleeve		Shell		Screw
Diameter (in)	Load (lbs)	Torque (ft. lbs)	Load (lbs)	Torque (ft. lbs)	Load (lbs)	Torque (ft. lbs)	Torque (ft. lbs)
1/4	800	10	400	4	1000	-	-
5/16	-	-	400	5	1400	-	-
3/8	1100	25	700	10	1800	-	10
1/2	2000	50	900	20	2700	-	10
5/8	2300	80	1100	45	3700	-	10
3/4	3700	150	1400	90	5400	-	20
1	5800	250	-	-	-	-	-

11. If the manufacturer's recommended installation torque is less than the test torque noted in the table, the manufacturer's recommended installation torque should be used in lieu of the tabulated values.

B. Expansion-type Anchors

1. The test load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, calibrated spring-loaded devices, or a calibrated torque wrench. Displacement-controlled anchors such as drop-ins shall not be tested using a torque wrench.
2. Anchors tested with a hydraulic jack should exhibit no discernable movement during the tension test, e.g., as evidenced by loosening of the washer under the nut.
3. Anchors tested with a calibrated torque wrench must attain the specified torque within 1/2 turn of the nut.
4. Exceptions: Undercut anchors that are so designed to allow visual confirmation of full set, need not be tension or torque tested. If the manufacturer's installation torque is less than the specified test torque, use the manufacturer's specified installation torque for testing the anchor.
5. Apply proof test loads to wedge and sleeve anchors without removing the nut if possible. If not, remove nut and install a threaded coupler to the same tightness as the original nut using a torque wrench to apply the test load.
6. For sleeve/shell internally threaded categories, verify that the anchor is not prevented from withdrawing by a baseplate or other fixtures. If restraint is found, loosen and shim or remove fixture(s) prior to testing.
7. Reaction loads from test fixtures may be applied close to the anchor being tested, provided the anchor is not restrained from withdrawing by the fixture(s).
8. Shell type anchors should be tested as follows:

- a. Visually inspect 25% for full expansion as evidenced by the location of the expansion plug in the anchor body. Plug location of a fully expanded anchor should be as recommended by the manufacturer, or, in the absence of such recommendation, as determined on the job site following the manufacturer's installation instructions. At least 5% of the anchors shall be proof loaded as indicated in the table above, but not less than three anchors per day for each different person or crew installing anchors, or;
 - b. Test installed anchors per current edition of the CBC Section 1913A.7.
- C. Epoxy-type (adhesive) Anchors
 - 1. Epoxy-type (adhesive) anchors shall be tension tested per current edition of the CBC Section 1913A.7. The tension test load shall equal twice the allowable load for the specific location of the anchor to be tested (i.e., accounting for edge distance) or 80% of the yield strength of the bolt ($0.8A_bF_y$), whichever is less. The test procedures for expansion-type anchors in the attached table shall also be used for epoxy-type (adhesive) anchors. Torque testing of epoxy-type (adhesive) anchors is not permitted.
 - 2. Where epoxy-type (adhesive) anchors are used as shear dowels across cold joints in slabs on grade and the slab is not part of the structural system, testing of those dowels is not required.
 - 3. Anchors shall exhibit no discernible movement during the tension test.
- D. Screw-type Anchors
- E. The following criteria apply for the acceptance of installed anchors:
 - 1. Hydraulic ram method: The anchor should have no observable movement at the applicable test load. For wedge and sleeve type anchors, a practical way to determine observable movement is that the washer under the nut becomes loose.
 - 2. Torque wrench method: The applicable test torque must be reached within the following limits:
 - a. Wedge or Sleeve type: One-half (1/2) turn of the nut.
 - b. One-quarter (1/4) turn of the nut for the 3/8 in. sleeve anchor only.

3.6 PAINTING

- A. Touchup:
 - 1. Clean field welds and abraded areas of shop paint.
 - 2. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting.
 - 3. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
 - 4. Comply with the following requirements
 - a. Architectural painting specifications
 - b. SSPC-PA 1 requirements for touching up field-painted surfaces.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION

SECTION 26 08 00

COMMISSIONING ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A Testing in conformity with equipment applicable to this project, applicable codes and authorities having jurisdiction
- B Test equipment requirements listed in this section shall apply to testing required by all other sections in Division 26, Division 27, and Division 28.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

- A Published specifications standards, tests or recommended methods of trade, industry or government organizations apply to work in this section as cited in Section 260000.
- B California Electrical Code
- C International Electrical Testing Association (NETA)
 - 1 NETA ATS: for Acceptance Testing Specifications for Electrical Power Equipment and Systems
- D Institute of Electrical and Electronic Engineers
 - 1 IEEE 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements
 - 2 IEEE 82: Standard Test Procedure for Impulse Voltage Tests on Insulated Conductors
 - 3 IEEE 95: Standard Test Procedure for Impulse Voltage Tests on Insulated Conductors
 - 4 IEEE 112: Standard Test Procedure for Polyphase Induction Motors and Generators
 - 5 IEEE 114: Standard Test Procedure for Single-Phase Induction Motors
 - 6 IEEE 115: IEEE Guide for Test Procedures for Synchronous Machines Part I—Acceptance and Performance Testing Part II—Test Procedures and Parameter Determination for Dynamic Analysis
 - 7 IEEE 141: Recommended Practice for Electric Power Distribution for Industrial Plants

- 8 IEEE 142: Recommended Practice for Grounding of Industrial and Commercial Power Systems
 - 9 IEEE 241: Recommended Practice for Electric Power Systems in Commercial Buildings
 - 10 IEEE 242: Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)
 - 11 IEEE 252: Standard Test Procedure for Polyphase Induction Motors Having Liquid in the Magnetic Gap
 - 12 IEEE 259: Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers
 - 13 IEEE 389: Recommended Practice for Testing Electronics Transformers and Inductors
 - 14 IEEE 393: Test Procedures for Magnetic Cores
 - 15 IEEE 399: Recommended Practice for Industrial and Commercial Power Systems Analysis (Brown Book)
 - 16 IEEE 400: Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5 kV and Above
 - 17 IEEE 442: Guide for Soil Thermal Resistivity Measurements
 - 18 IEEE 495: Guide for Testing Faulted Circuit Indicators
 - 19 IEEE 576: Recommended Practice for Installation, Termination, and Testing of Insulated Power Cable as Used in Industrial and Commercial Applications
 - 20 IEEE 1188: Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications
 - 21 IEEE 1234: Guide for Fault Locating Techniques on Shielded Power Cable Systems
 - 22 IEEE 1415: Guide for Induction Machinery Maintenance Testing and Failure Analysis
 - 23 IEEE 1458: Recommended Practice for the Selection, Field Testing, and Life Expectancy of Molded Case Circuit Breakers for Industrial Applications
- E National Institute of Standards and Technology (NIST)
- F Underwriters' Laboratories
- 1 UL 1244: Electrical and Electronic Measuring and Testing Equipment
 - 2 UL 1436: Outlet Circuit Testers and Similar Indicating Devices
 - 3 UL 61010-2-030: Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for testing and measuring circuits
 - 4 UL 61010B-1: Electrical Measuring and Test Equipment – Part 1: General Requirements
 - 5 UL 61010B-2-031: Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2: Particular Requirements for Hand-Held Probe Assemblies for Electrical Measurement and Test
 - 6 UL 61010B-2-032: Electrical Equipment for Measurement, Control, and Laboratory Use – Part 2: Particular Requirements for Hand-Held Current Clamps for Electrical Measurement and Test

1.4 QUALITY ASSURANCE

- A The Contractor shall engage and pay for the services of a recognized independent testing laboratory for the purpose of performing inspections and tests as herein specified.
- B The testing laboratory shall provide all material, equipment, labor and technical supervision to perform switch tests and inspections.
- C It is the intent of these tests to assure that all electrical equipment, both Contractor and Owner supplied, is operational within industry and manufacturer's tolerances and is installed in accordance with design specifications.
- D The tests and inspections shall determine the suitability for energizing.
- E Schedule tests and give a minimum of two weeks advance notice to the Owner.

1.5 SUBMITTALS

- A List of tests preformed
- B Test procedures
- C Test results
- D The submittal shall be substantially complete for all items and equipment furnished under this section.
- E Individual drawings and data sheets submitted at random intervals will not be accepted for review.

1.6 QUALIFICATIONS OF TESTING AGENCY

The testing agency shall meet federal OSHA criteria for accreditation of testing laboratories, Standard Number 1910.7 (Definition and Requirements for a nationally recognized testing laboratory). International Electrical Testing Association (NETA) accreditation constitutes proof of meeting such criteria.

1.7 TEST INSTRUMENT TRACEABILITY

- A The testing laboratory shall have a calibration program which maintains all applicable test instrumentation within rated accuracy.
- B The accuracy shall be traceable to the National Institute of Standards and Technology (NIST) in an unbroken chain.
- C Instruments shall be calibrated in accordance with the following frequency schedule:
 - 1 Field instruments: 6 months maximum.
 - 2 Laboratory instruments: 12 months.
 - 3 Leased specialty equipment: 12 months
- D Dated calibration labels shall be visible on all test equipment.

1.8 FINAL SETTINGS

- A The test report shall include the following: summary of project, description of equipment tested, description of test, list of test equipment used in calibration and calibration date, test results, conclusions and recommendations, and appendix, including appropriate test forms.
- B The test report shall be bound and its contents certified.
- C Submit three copies of the completed report to the architect, or engineer if no architect is involved, no later than fifteen (15) days after completion of test, unless otherwise directed.

1.9 FAILURE TO TEST

- A Any system material or workmanship which is found defective on the basis of acceptance tests shall be reported directly to the architect or engineer if no architect is involved.
- B Contractor shall replace the defective material or equipment and have test repeated until test proves satisfactory without additional cost to the Owner.

PART 2 – PRODUCTS: [NOT USED]

PART 3 – EXECUTION

3.1 GROUND RESISTANCE TEST

- A Building ground electrode resistance testing shall be accomplished with a ground resistance, direct-reading, single test meter utilizing the Fall-of-Potential method and two (2) referenced electrodes. Perform test prior to interconnection to other grounding system. Orient the concrete-encased ground electrode to be tested and the two referenced electrodes in straight line spaces fifty (50) feet apart. Drive the two (2) reference electrodes ten (10) feet deep.
- B Test results shall be in writing, and shall show temperature, humidity and condition of the soil at the time of the tests. In the case where the ground resistance exceeds 25 ohms, add an additional ground rod and retest. Add additional ground rods when necessary in order to bring the ground resistance below 25 Ohms. All testing shall be done prior to concrete pour and in the presence of the inspector of record. Provide test results for engineer review.

3.2 MISCELLANEOUS TESTING

- A Functional and operational testing to the fire alarm, security system, telephone system, paging/intercom system, and all electrical components upon completion of electrical work.
- B Perform an insulation resistance test on all switchboard busses, bus ducts; feeder conductors, including neutrals, using a megohmmeter. Minimum value for each conductor shall be 20 megohms.

3.3 ELECTRICAL DISTRIBUTION EQUIPMENT OPERATIONAL CHECK

- A Electrical distribution equipment operational check includes main switchboards, distribution boards, panelboards, panels, switchgear, etc.
- B Verify proper operating condition of all equipment mechanically and electrically including, but not limited to verifying operation of each circuit breaker trip device with a rating of 100A or more using an accurately metered timed instrument (by passing 300% rated current through each pole).
- C If any equipment is found defective during operational check, it shall be replaced by the Contractor without cost to the Owner. The tests shall be repeated by the Contractor without cost to the owner until satisfactory results are obtained.

END OF SECTION

SECTION 26 22 00

LOW VOLTAGE (0-600V) TRANSFORMERS

PART 1 – GENERAL

1.1 SECTION INCLUDES

This section includes minimum requirement for low voltage transformers.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

- A Transformers 750kVA and smaller shall be listed by Underwriters Laboratories.
- B Institute of Electrical and Electronics Engineers (IEEE)
 - 1 IEEE 259: Standard Test Procedure for Evaluation of Systems of Insulation for Dry-Type Specialty and General-Purpose Transformers
 - 2 IEEE 295: Electronics Power Transformers
 - 3 IEEE 389: Recommended Practice for Testing Electronics Transformers and Inductors
 - 4 IEEE 393: Test Procedures for Magnetic Cores
 - 5 IEEE C57.12.01: Standard General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin Encapsulated Windings
 - 6 IEEE C57.12.28: Pad Mounted Equipment Enclosure Integrity
 - 7 IEEE C57.12.28: Pad Mounted Equipment Enclosure Integrity for Coastal Applications (where applicable)
 - 8 IEEE C57.12.34: Three Phase, Pad Mounted, Distribution Transformers
 - 9 IEEE C57.12.38: Single Phase, Pad Mounted, Distribution Transformers
 - 10 IEEE C57.12.60: Standard Test Procedure for Thermal Evaluation of Insulation Systems for Dry-Type Power and Distribution Transformers, Including Open-Wound, Solid-Cast, and Resin-Encapsulated Transformers
 - 11 IEEE C57.12.91: Standard Test Code for Dry-type Distribution and Power Transformers
 - 12 IEEE C57.98: Guide for Transformer Impulse Tests
- C National Electrical Manufacturers' Association
 - 1 Transformers shall be manufactured and tested in accordance with NEMA ST20.
 - 2 Transformers losses shall conform to NEMA TP1 requirements.

- 3 Transformer losses shall be tested in accord with NEMA TP2 procedures.
- 4 Transformers shall be labeled in accord with NEMA TP3 requirements.
- D National Fire Protection Association
 - 1 NFPA 70: National Electrical Code w/ State Amendments (CEC)
- E ANSI C57.110 and ANSI C57.12.22 requirements for pad mounted, compartmental type, self cooled, three phase distribution transformers and applicable provisions of other ANSI standards C57 Series.
- F Underwriters' Laboratories
 - 1 UL 50: Enclosures for Electrical Equipment, Non-environmental Considerations
 - 2 UL 50E: Enclosures for Electrical Equipment, Environmental Considerations
 - 3 UL 467: Grounding and Bonding Equipment
 - 4 UL 486E: Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
 - 5 UL 506: Specialty Transformers
 - 6 UL 1332: Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment
 - 7 UL 1446 Systems of Insulating Materials – General
 - 8 UL 1561: Dry-type General Purpose and Power Transformers
 - 9 UL 2763: Energy Efficient Harmonic Cancellation Transformers
 - 10 UL 5085-1: Low Voltage Transformers – Part 1: General Requirements
 - 11 UL 5085-2: Low Voltage Transformers – Part 2: General Purpose Transformers
 - 12 UL 5085-3: Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers

1.4 QUALITY ASSURANCE

- A Equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.
- B Supply equipment and accessories new, free from defects.
- C Supply equipment and accessories in compliance with the applicable standards listed in Article 1.3 of this section and with applicable national, state and local codes.
- D Items of a given type shall be the products of the same manufacturer.
- E Ship equipment in its original packages to prevent damaging or entrance of foreign matter. Perform handling and shipping in accordance with manufacturer's recommendations. Provide protective covering during construction.
- F Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by the engineer.
- G Tag items with a weatherproof tag identifying equipment by name and purchase order number. Include packing and shipping lists.

1.5 SUBMITTALS

- A Submit under provisions of Section 013000 or 013300.
- B Submittals shall include the following:
 - 1 Table of contents
 - 2 A complete set of detailed manufacturer's specifications describing and illustrating all standard and special components and materials

- 3 Part numbers
- 4 Evidence of compliance with the applicable standards listed under Article 1.3 of this section
- 5 Maintenance instructions and intervals
- 6 A complete set of drawings for any special items
- 7 Wiring diagrams
- 8 Drawings shall include designations, dimensions, operating controls, instruments, riser diagrams, routing diagrams etc.
- C Electronic submittals shall be searchable
- D Shop drawings required: drawings and descriptions containing information of weight, dimensions, rated kVA, sound level, impedance, voltage regulation and efficiency. Provide manufacturer's literature describing the product.
- E Test report of transformer furnished as hereinafter specified.
- F The submittal shall be substantially complete for all items and equipment furnished under this section.
- G Individual drawings and data sheets submitted at random intervals will not be accepted for review.
- H Substitutions: Items of same function and performance shall be submitted in conformance with Division 1.

1.6 OPERATION AND MAINTENANCE MANUALS

- A Submit operation and maintenance manuals in accordance with Section 260000.
- B The manuals shall, at minimum, include the following:
 - 1 Manufacturer (including contact information)
 - 2 Model number
 - 3 Manufacturer's data sheets – When data sheets include more than one model the model(s) used shall be noted
 - 4 Manufacturer's user and maintenance manual(s), including trouble-shooting guidelines
 - 5 Configuration settings
 - 6 Wiring diagrams
 - 7 Voltage ratings
 - 8 Current ratings
 - 9 Calibrated range
 - 10 List of capabilities
 - 11 Environmental ratings
 - 12 NEMA enclosure type
 - 13 Maintenance requirements
 - 14 Installation instructions
 - 15 Repair instructions
- C Provide manuals in one of the following formats
 - 1 Three hardcopies
 - 2 PDF

PART 2 – PRODUCTS

2.1 DISTRIBUTION TRANSFORMERS

- A General
 - 1 Except as otherwise indicated, provide manufacturer's standard materials and components as indicated by published product information, designed and constructed as recommended by manufacturer and as required for complete installation.
 - 2 Temperature
 - a 150°C rise
 - b Self-cooled type
 - c The maximum temperature of the top of the enclosure shall not exceed 50°C rise above a 40°C ambient.
 - 3 Impedance shall be manufacturer's standard.
 - 4 All insulating materials used shall be in accordance with NEMA ST20 or NEMA TR27 standards and be rated for 220°C UL component recognized insulation system.
 - 5 The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE and ANSI standards.
 - 6 Primary voltage, secondary voltage, and kVA capacity shall be as shown on the single line or three line diagram(s).
 - 7 All windings shall be copper.
- B Manufacturer:
 - 1 Square D
 - 2 General Electric
 - 3 Eaton
 - 4 Approved equal
- C Enclosure
 - 1 Dead front
 - 2 Transformers 25 kVA and larger shall be in a heavy gauge, sheet steel, ventilated enclosure
 - 3 Provide wire fabric rodent guard over ventilated openings and designed to prevent accidental access to live parts in accordance with UL, NEMA, and California Electric Code standards for ventilated enclosures.
 - 4 Mounting
 - a Transformers 15 kVA through 75 kVA shall be designed so they can be either floor or wall mounted.
 - b Transformers above 75 kVA shall be floor mounted.
 - 5 Corrosion resistant coating
 - a The completed enclosure shall be degreased and cleaned.
 - b After the cleaning process is finished, the enclosure shall be phosphatized.
 - c After the phosphatizing, the enclosure shall receive an electrostatic deposition of polyester powder coating followed by baking to produce a hard durable finish.
 - 1 The minimum thickness of the paint film shall be 2.0 mils.
 - 2 For the exterior of transformer tank, interior and exterior of primary and secondary cable compartments the minimum total dry film thickness shall be 3.5 mils.
 - 3 Paint film shall be uniform in color and free from blisters, sags, flaking and peeling
 - d Finish shall conform to UL 50 and UL 50E.

- e Color shall be ANSI 61 Gray.
 - f Coat underside surfaces of equipment outdoors or in damp locations with a corrosion resistant coating.
- D Sound: Sound levels shall be guaranteed by the manufacturer not to exceed the following.

1	15-50 kVA	45 dB
2	51-150 kVA	50 dB
3	151-300 kVA	55 dB
4	301-500 kVA	60 dB
5	501-700 kVA	62 dB
6	701-1000 kVA	64 dB
7	1000-1500 kVA	65 dB
8	1501-2000 kVA	66 dB
- E Efficiency: Transformers shall be low loss type with minimum efficiencies per NEMA TP1 when operated at 35% of full load capacity. Efficiency shall be tested in accord with NEMA TP2.

Single Phase		Three Phase	
kVA	Efficiency	kVA	Efficiency
15	97.7%	15	97.0%
25	98.0%	30	97.5%
37.5	98.2%	45	97.7%
50	98.3%	75	98.0%
75	98.5%	112.5	98.2%
100	98.6%	150	98.3%
167	98.7%	225	98.5%
250	98.8%	300	98.6%
333	98.9%	500	98.7%
700	98.9%	750	98.8%
- F The transformer(s) shall supply phase shift of 0° or 30°.
- G Transformers shall be supplied with quality, full width electrostatic shields resulting in a maximum effective coupling capacitance between primary and secondary of 33 picofarads. With transformers connected under normal, loaded operating conditions, the attenuation of line noise and transients shall equal or exceed the following limits.

1	Common Mode: 0 to 1.5kHz - 120dB; 1.5kHz to 10kHz - 90dB; 10kHz to 100kHz - 65dB; 100kHz to 1MHz - 40dB
2	Transverse Mode: 1.5kHz to 10kHz - 52dB; 10kHz to 100kHz - 30dB; 100kHz to 1MHz - 30dB
- H Taps: distribution transformers shall come equipped with the following taps.

1	2.5% FCAN
2	5.0% FCAN
3	2.5% FCBN
4	5.0% FCBN
5	7.5% FCBN
6	10.0% FCBN
- I All transformers listed below shall be K-13 rated unless explicitly noted as having a different K rating on the plans.

1	All school transformers
2	Any transformer feeding a load where the load from harmonic producing devices is at least 50% of the transformer's capacity.

2.2 BUCK-BOOST TRANSFORMERS

- A. Where the available voltage is above the acceptable range (including taps), provide and install a bucking transformer.
- B. Where the available voltage is below the acceptable range (including taps), provide and install a boosting transformer.
- C. Voltage at secondary of buck or boost transformer shall be as close as possible to the nominal voltage of the system. Coordinate secondary voltage of buck or boost transformer, quantity of buck or boost transformers, and use of taps on distribution transformer to achieve this.
- D. Transformer shall be compatible with the voltage.
- E. Temperature rise, enclosure, efficiencies, and sound levels shall meet the requirements of the distribution transformers.

2.3 CONTROLS TRANSFORMERS

- A. Control transformers shall provide secondary voltage within limits of the equipment that it supplies.
- B. Transformer shall be completely enclosed or have OEM covers for all exposed, live parts. Covers shall be securely mounted transformer.
- C. When transformers are mounted within a control panel, the transformer shall be mounted at the top, near a vent.
- D. Whenever possible, the transformer shall be mounted outside of hazardous areas. When not possible, the transformer shall be listed for use within the classification of the hazardous area.
- E. Temperature rise, enclosure, efficiencies, and sound levels shall meet the requirements of the distribution transformers.

2.4 CONSTRUCTION

- A Transformer coils shall be of copper windings, continuous wound construction, and shall be impregnated with non-hygroscopic, thermosetting varnish.
- B All cores shall be constructed with low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point to prevent core overheating. Cores for transformers greater than 500kVA shall be clamped utilizing insulated bolts through the core laminations to ensure proper pressure throughout the length of the core. The completed core and coil shall be bolted to the base of the enclosure but isolated by means of rubber vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure except for a flexible safety ground strap. Sound isolation systems requiring the complete removal of all fastening devices will not be acceptable.
- C The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.
- D The transformer enclosures shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.

PART 3 – EXECUTION

3.1 ANCHORING

- A Install transformers as indicated, complying with manufacturers written instructions, applicable requirements of CEC, NEMA, ANSI, and IEEE standards, and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B Floor and roof mounted transformers shall be mounted on steel plates cemented to neoprene pads with a bolt hole through both. Refer to details. Conduit entering transformers shall be isolated from case with oversize hole, ground wire, and rubber grommet.
- C Anchor transformer to concrete pad with 3/4" minimum diameter anchor bolts. Bolts and washers shall be galvanized. Strength of materials used to secure the transformer shall be sufficient to resist shear and uplift produced by force equal to one half of the equipment mass applied horizontally at center of gravity.

3.2 GROUNDING

Provide equipment grounding connections, sufficiently tight, to assure permanent and effective ground, for transformers as indicated.

3.3 TESTING

Upon completion of installation of transformers, energize primary circuit at rated voltage and frequency from normal power source and test transformers, including, but not limited to, audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with re-testing.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 – GENERAL

1.1 SECTION INCLUDES

Lighting and Appliance Panelboards

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

- A Published specifications standards, tests or recommended methods of trade, industry or government organizations apply to work in this section as cited in Section 260000.
- B California Electrical Code
- C California Building Code
- D Institute of Electrical and Electronic Engineers (IEEE)
 - 1 IEEE 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
 - 2 IEEE 100: The Authoritative Dictionary of IEEE Standards Terms
 - 3 IEEE C2 National Electrical Safety Code
 - 4 IEEE C12.16: Solid-State Electricity Meters
 - 5 IEEE C37.13: Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures
 - 6 IEEE C37.20.1: Standard for Metal-Enclosed Low-Voltage Power Circuit-Breaker Switchgear
 - 7 IEEE C37.90.1: Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
 - 8 IEEE C57.12.28: Standard for Pad-Mounted Equipment - Enclosure Integrity
 - 9 IEEE C57.12.29: Standard for Pad-Mounted Equipment - Enclosure Integrity for Coastal Environments
 - 10 IEEE C57.13: Standard Requirements for Instrument Transformers
- E National Electrical Manufacturers' Association
 - 1 NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum)
 - 2 NEMA PB 2: Deadfront Distribution Switchboards

- 3 NEMA PB 2.1: General Instructions for Proper Handling, Installation, Operation and Maintenance of Deadfront Distribution Switchboards Rated 600 V or Less
- 4 NEMA ST 20: Standard for Dry-Type Transformers for General Applications
- 5 NEMA 12.10: Physical Aspects of Watthour Meters - Safety Standards
- F National Electrical Testing Association (NETA)
 - 1 NETA ATS: Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems
- G Underwriters' Laboratories (UL)
 - 1 UL 50: Enclosures for Electrical Equipment, Non-environmental Considerations
 - 2 UL 50E: Enclosures for Electrical Equipment, Environmental Considerations
 - 3 UL 467: Grounding and Bonding Equipment
 - 4 UL 486A: Wire Connectors
 - 5 UL 486B: Wire Connectors
 - 6 UL 486E: Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
 - 7 UL 489: Molded Case Circuit Breakers, Molded Case Switches, and Circuit Breaker Enclosures
 - 8 UL 891: Switchboards
 - 9 UL 1053: Ground-fault Sensing and Relaying Equipment
 - 10 UL 1059: Terminal Blocks
 - 11 UL 1558: Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
 - 12 UL 2062: Enclosures for Use in Hazardous (Classified) Locations
 - 13 UL 2735: Electric Utility Meters
 - 14 UL 60947-1: Low-Voltage Switchgear and Controlgear – Part 1: General Rules
 - 15 UL 60947-7-1: Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment - Terminal blocks for copper conductors
 - 16 UL 60947-7-2: Low-Voltage Switchgear and Controlgear - Part 7-2: Ancillary Equipment - Protective Conductor Terminal Blocks for Copper Conductors

1.4 QUALITY ASSURANCE

- A Equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.
- B Supply equipment and accessories new, free from defects.
- C Supply equipment and accessories in compliance with the applicable standards listed in Article 1.3 of this section and with applicable national, state and local codes.
- D Items of a given type shall be the products of the same manufacturer.
- E Ship equipment in its original packages to prevent damaging or entrance of foreign matter. Perform handling and shipping in accordance with manufacturer's recommendations. Provide protective covering during construction.
- F Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by the engineer.

- G Tag items with a weatherproof tag identifying equipment by name and purchase order number. Include packing and shipping lists.

1.5 SUBMITTALS

- A Submit under provisions of Section 013000 or 013300.
- B Submittals shall include the following:
 - 1 Table of contents
 - 2 A complete set of detailed manufacturer's specifications describing and illustrating all standard and special components and materials
 - 3 Part numbers
 - 4 Evidence of compliance with the applicable standards listed under Article 1.3 of this section
 - 5 Maintenance instructions and intervals
 - 6 Calibration procedures and intervals
- C Submit shop drawings that include:
 - 1 Complete fabrication details
 - 2 Elevations and sections of enclosure(s)
 - 3 Dimensions of enclosure(s)
 - 4 Space available for conduits
 - 5 Voltage, ampacity, short circuit, and enclosure ratings
 - 6 Short circuit withstand ability of bus and lowest rated device,
 - 7 Circuit schedule showing circuit number, device description, circuit breaker frame ampere rating and trip or fuse clip ampere rating
 - 8 Termination lug size
 - 9 Feeder identification
 - 10 Single line diagram
 - 11 Include both elementary diagram and terminal to terminal wiring diagrams.
- D Electronic submittals shall be searchable
- E The submittal shall be substantially complete for all items and equipment furnished under this section.
- F Individual drawings and data sheets submitted at random intervals will not be accepted for review.
- G Substitutions: Items of same function and performance shall be in conformance with Division 1. The Contractor shall provide a comparison of the proposed substitute with the specified equipment for review by the Engineer.
- H Submit field test and operations check report for circuit breakers under provisions of Section 260500.

1.6 OPERATION AND MAINTENANCE MANUALS

- A Submit operation and maintenance manuals in accordance with Section 260000.
- B The manuals shall, at minimum, include the following:
 - 1 Manufacturer (including contact information)
 - 2 Model number
 - 3 Manufacturer's data sheets – When data sheets include more than one model the model(s) used shall be noted
 - 4 Manufacturer's user and maintenance manual(s), including trouble-shooting guidelines

- 5 Configuration settings
- 6 Wiring diagrams
- 7 Voltage ratings
- 8 Current ratings
- 9 List of capabilities
- 10 Environmental ratings
- 11 NEMA enclosure type
- 12 Maintenance requirements
- 13 Installation instructions
- 14 Repair instructions
- C Provide manuals in one of the following formats
 - 1 Three hardcopies
 - 2 PDF

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A Square D Company
 - 1 I-LINE - CLASS 2110
 - 2 NQOD - CLASS 1630
 - 3 NF - Class 1670
- B Equals
 - 1 General Electric
 - 2 Eaton/Cutler-Hammer
 - 3 Approved equal

2.2 TYPE NQOD PANELBOARD

- A Interior
 - 1 Shall be type NQOD panelboard or approved equal rated for 240V_{AC}/48V_{DC} maximum. Continuous main current ratings, as indicated on associated schedules, not to exceed 600 amperes maximum.
 - 2 Minimum short circuit current rating: 22000AIC as indicated in rms symmetrical amperes at 240V_{AC}.
 - 3 Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be copper. Bussing shall be copper as standard construction.
 - 4 Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.
- B Main Circuit Breaker
 - 1 Main circuit breakers shall have an over-center, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40°C ambient

environment. Thermal elements shall be ambient compensating above 40°C.

- 2 Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker which allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.
- 3 Breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.
- 4 Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors 90°C rated wire, sized according to the 75°C temperature rating per CEC Table 310-16.

C Enclosures

- 1 Type 1 Boxes
 - a Boxes shall be galvanized steel constructed in accordance with UL 50 requirements.
 - b Boxes shall have removable end walls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
 - c Box width shall be 20 in wide.
- 2 Type 1 Fronts
 - a Front shall meet strength and rigidity requirements per UL 50 standards.
 - b Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be keyed alike. Two (2) keys shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
 - c All electrical busses shall be copper.
- 3 Type 3R, 5, and 12
 - a Enclosures shall be constructed in accordance with UL 50 requirements
 - b All doors shall be gasketed and equipped with a tumbler type vault lock. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
 - c Maximum enclosure dimensions shall not exceed 20 in wide and 6.5 in deep.

2.3 TYPE NF PANELBOARD

A Interior

- 1 Shall be type NF panelboard for 480Y/277V_{AC} maximum. Continuous main current ratings, as indicated on associated schedules, not to exceed 600 amperes maximum.
- 2 Minimum Short Circuit Rating: 14000 as indicated rms symmetrical amperes at 480Y/277V_{AC}.
- 3 Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors limited to bolt-on branch

- circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be copper. Bussing rated for 600 amperes shall be copper as standard construction.
- 4 Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.
- B Main Circuit Breaker**
- 1 Main circuit breakers shall have an over-center, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40°C ambient environment. Thermal elements shall be ambient compensating above 40°C.
 - 2 Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the breaker which allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.
 - 3 Circuit breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.
 - 4 Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 90°C rated wire, sized according to the 75°C temperature rating per CEC Table 310-16.
- C Enclosures**
- 1 Type 1 Boxes
 - a Boxes shall be galvanized steel constructed in accordance with UL 50 requirements.
 - b Boxes shall have removable end walls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
 - 2 Type 1 Fronts
 - a Front shall meet strength and rigidity requirements per UL 50 standards.
 - b Front shall have flat latch type lock with catch and spring loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
 - 3 Type 3R, 5, and 12
 - a Enclosures shall be constructed in accordance with UL 50 requirements
 - b All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional trunk type latches. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
 - c Maximum enclosure dimensions shall not exceed 21 inches wide and 8 inches deep.

2.4 ENCLOSURE FINISH

- A The completed enclosure shall be degreased and cleaned.
- B After the cleaning process is finished, the enclosure shall be phosphatized.
- C After the phosphatizing, the enclosure shall receive an electrostatic deposition of polyester powder coating followed by baking to produce a hard durable finish.
 - 1 The minimum thickness of the paint film shall be 2.0 mils.
 - 2 For the exterior of transformer tank, interior and exterior of primary and secondary cable compartments the minimum total dry film thickness shall be 3.5 mils.
 - 3 Paint film shall be uniform in color and free from blisters, sags, flaking and peeling
- D Finish shall conform to UL 50 and UL 50E.
- E Color shall be ANSI 61 Gray.
- F Coat underside surfaces of equipment outdoors or in damp locations with a corrosion resistant coating.

2.5 NAMEPLATES

Provide and install nameplates per Section 260500.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install all equipment per manufacturers' instructions.
- B. Test all equipment per manufacturer's instructions.
- C. Mount panelboards with center of top circuit breaker handle no higher than 78" above finished floor. Install flush mounted panelboards as indicated on architectural interior elevation drawings. Provide all necessary blocking, channels and other hardware for securing panelboards to wall, column or other parts of building structure.
- D. Submit three copies of the certified list for permanent record to be referenced to in the event of failure of any motor either within or beyond expiration of the warranty period.

3.2 GROUNDING

- A. Ground equipment per manufacturer's instructions, Section 260500, and applicable codes.
- B. Minimize resistance from device to ground.
- C. Resistance from device to ground shall not exceed 25 ohms.

3.3 LOAD BALANCING

If the contractor changes circuiting from the panel schedule on the approved plans, the contractor shall be responsible to ensure that the loads on any two phases differ by no more than 5%.

3.4 IDENTIFICATION

- A Provide nameplate identifying panel on exterior of panel per requirements in Section 260500.
- B Provide type written panel schedule on interior of door.

END OF SECTION

SECTION 26 27 00

LOW VOLTAGE (0-600V) DISTRIBUTION EQUIPMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES

Materials, equipment fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction, for the following:

- A Wiring devices
- B Terminal cabinets
- C Power distribution terminal blocks

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS

Published specification standards, tests or recommended methods of trade, industry or government organizations apply to work in this section as cited in Section 260000.

- A California Building Code
- B California Electrical Code
- C Underwriters' Laboratories
 - 1 UL 20: General Use Snap Switches
 - 2 UL 50: Enclosures for Electrical Equipment, Non-environmental Considerations
 - 3 UL 50E: Enclosures for Electrical Equipment, Environmental Considerations
 - 4 UL 111: Multi-Outlet Assemblies
 - 5 UL 231: Power Outlets
 - 6 UL 486A: Wire Connectors
 - 7 UL 486B: Wire Connectors
 - 8 UL 486E: Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
 - 9 UL 498: Attachment Plugs and Receptacles
 - 10 UL 514A: Metallic Outlet Boxes
 - 11 UL 514C: Nonmetallic Outlet Boxes, Flush-device Boxes, and Covers
 - 12 UL 514D: Cover Plates for Flush-mounted Wiring Devices
 - 13 UL 917: Clock Operated Switches
 - 14 UL 943: Ground Fault Circuit Interrupters

- 15 UL 1010: Receptacle Plug Combinations for Use in Hazardous (Classified) Locations
- 16 UL 1681: Wiring Devices Configurations
- 17 UL 1682: Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type
- 18 UL 1773: Standard for Termination Boxes
- 19 UL 1801: Power Distribution Centers for Communications Equipment
- 20 UL 1953: Power Distribution Terminal Blocks
- 21 UL 2255: Standard for Receptacle Closures
- 22 UL 2682: Switch Rated Plugs and Receptacles

1.4 QUALITY ASSURANCE

- A Equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.
- B Supply equipment and accessories new, free from defects.
- C Equipment and accessories in compliance with the applicable standards listed in Article 1.3 of this section and with applicable national, state and local codes.
- D Items of a given type shall be the products of the same manufacturer.
- E Deliver, store and protect products under provisions of Section 016200.
- F Ship equipment in its original packages, to prevent damaging or entrance of foreign matter. Perform handling and shipping in accordance with manufacturer's recommendations. Provide protective covering during construction.
- G Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by the engineer.
- H Tag items with a weatherproof tag identifying equipment by name and purchase order number. Include packing and shipping lists.

1.5 SUBMITTALS

- A Submit under provisions of Section 013000 or 013300.
- B Submittals shall include the following:
 - 1 Table of contents
 - 2 A complete set of detailed manufacturer's specifications describing and illustrating all standard and special components and materials
 - 3 Part numbers
 - 4 Evidence of compliance with the applicable standards listed under Article 1.3 of this section
 - 5 Maintenance instructions and intervals
 - 6 Calibration procedures and intervals
 - 7 A complete set of drawings for any special items
 - 8 A single line block diagram showing exactly the manner in which the contractor proposes to layout the system.
 - 9 Wiring diagrams
 - 10 Illustrations and scale drawing of the racks, equipment layouts etc.
 - 11 Drawings shall include designations, dimensions, operating controls, instruments, riser diagrams, routing diagrams etc.
 - 12 The contractor shall also submit a copy of his valid state contractor's license and show proof that he is a distributor of the submitted equipment.
- C Electronic submittals shall be searchable
- D The submittal shall be substantially complete for all items and equipment

- furnished under this section.
- E Individual drawings and data sheets submitted at random intervals will not be accepted for review.
 - F Substitutions: Items of same function and performance shall be submitted in conformance with Division 1.

1.6 OPERATION AND MAINTENANCE MANUALS

- A Submit operation and maintenance manuals in accordance with Section 260000.
- B The manuals shall, at minimum, include the following:
 - 1 Manufacturer (including contact information)
 - 2 Model number
 - 3 Manufacturer's data sheets – When data sheets include more than one model the model(s) used shall be noted
 - 4 Manufacturer's user and maintenance manual(s), including trouble-shooting guidelines
 - 5 Configuration settings
 - 6 Wiring diagrams
 - 7 Voltage ratings
 - 8 Current ratings
 - 9 List of capabilities
 - 10 Environmental ratings
 - 11 NEMA enclosure type
 - 12 Maintenance requirements
 - 13 Installation instructions
 - 14 Repair instructions
- C Provide manuals in one of the following formats
 - 1 Three hardcopies
 - 2 PDF

PART 2 – PRODUCTS

2.1 WIRING DEVICES

- A Wall (Local) Switches
 - 1 Totally enclosed
 - 2 AC rated
 - 3 20A rated
 - 4 Silent type, unless noted otherwise on the plans
 - 5 Manufacturers
 - a Hubbell Premise Wiring
 - b Leviton
 - 6 Grade
 - a Medical facilities: Hospital Grade
 - b Commercial facilities: Specification Grade
 - c Educational facilities: Heavy Duty Specification Grade
 - d Industrial facilities: Industrial Grade or Extra Heavy Duty Specification Grade
- B Receptacles
 - 1 Duplex receptacles shall be 20A, 125V_{AC} rated, 3-wire, grounded

- 2 Receptacle shall include a LED that indicates it has power.
- 3 Receptacles shall be tamperproof.
- 4 Manufacturers
 - a Hubbell Premise Wiring
 - b Leviton
- 5 Grade
 - a Commercial facilities: Specification Grade
 - b Educational facilities: Heavy Duty Specification Grade
 - c Industrial facilities: Industrial Grade or Extra Heavy Duty Specification Grade
 - d Medical facilities: Hospital Grade
 - e Residential: Residential Grade
- 6 Exterior receptacle plates shall have steel, weatherproof, vandal-resistant while-in-use cover with key lockable/locking cover with keys to match owner standards.
- 7 All automatically switched receptacles shall be marked per 2017 NEC 406.3(E).
- C Other special purpose receptacles shown on Drawings shall be of same quality.
- D GFI receptacles shall self test every 3 seconds and indicate if the GFI protection has passed or failed the test.
- E Wall Plates shall be satin finish stainless steel
- F Switches and receptacles shall be gray except as noted below.
 - 1 Isolated Ground (IG) receptacle: Orange
 - 2 Equipment on emergency system: Red
 - 3 Receptacle with surge suppression: Blue
 - 4 Isolated ground receptacles with feature dependant color (other than orange) shall have orange triangle.
 - 5 Follow the facility has a color code scheme if the facility has one. Verify with owner.

2.2 TERMINAL CABINETS

- A Construction
 - 1 Fabricated from code gauge steel, size as indicated on drawings, with flush latch and concealed hinges and mounting screws.
 - 2 Enclosure for flush mounted cabinets shall be designed for flush mounting.
 - 3 Enclosure for surface mounted cabinets shall be designed for surface mounting.
- B Where size is not indicated, the minimum size shall be 24 inches wide x 30 inches high x 4 inches deep.
- C Cabinet shall be Square D "Mono-Flat Fronts", or approved equal.
- D Terminal cabinets shall include a backboard at inside back of cabinet.
 - 1 The backboard shall be 3/4" inch thick plywood
 - 2 Paint backboard with 3 coats of fire retardant paint.
- E Provide and install one terminal point for each wire within the terminal cabinet.
- F NEMA type:
 - 1 Interior, non-corrosive, non-hazardous (classified) locations: NEMA 1
 - 2 Exterior locations with vents: NEMA 3R
 - 3 Cooled enclosures: NEMA 4
 - 4 Enclosures containing electronics in dusty areas or outdoors: NEMA 4

- 5 Enclosures in hazardous (classified) locations: NEMA 4 or 4X (corrosive locations) listed for hazardous classification
- 6 Enclosure in corrosive locations: NEMA 4X
- 7 All seams on NEMA 3R, 4, and 4X enclosures shall be continuously welded with welds ground smooth.
- G Coating
 - 1 The completed enclosure shall be degreased and cleaned.
 - 2 After the cleaning process is finished, the enclosure shall be phosphatized.
 - 3 After the phosphatizing, the enclosure shall receive an electrostatic deposition of polyester powder coating followed by baking to produce a hard durable finish.
 - a The minimum thickness of the paint film shall be 2.0 mils.
 - b For the exterior of transformer tank, interior and exterior of primary and secondary cable compartments the minimum total dry film thickness shall be 3.5 mils.
 - c Paint film shall be uniform in color and free from blisters, sags, flaking and peeling
 - 4 Finish shall conform to UL 50 and UL 50E.
 - 5 Color shall be ANSI 61 Gray.
 - 6 Coat underside surfaces of equipment outdoors or in damp locations with a corrosion resistant coating.

2.3 POWER DISTRIBUTION TERMINAL BLOCKS

- A Power distribution terminal blocks (PDTB) shall be finger-safe, NEMA 1 type.
- B Conducting material shall be copper.
- C Current rating and short circuit rating of PDTBs shall be no lower than upstream overcurrent protective device.
- D Terminals
 - 1 Each terminal shall be screw type and be designed for wire size connecting to it.
 - 2 PDTB shall have one terminal for each wire connected to it on both load and line sides.
- E Load wire sizes and OCPD shall comply with CEC 240.21(B) and 240.92(B) as well as all other applicable codes.
- F PDTBs shall have provisions for panel or DIN rail mounting.
- G PDTBs shall be mounted within enclosure unless otherwise noted.

2.4 NAMEPLATES

Provide and install nameplates per Section 260500.

PART 3 – EXECUTION

3.1 GENERAL

- A Electric system layouts indicated on the Drawings are generally diagrammatic, but shall be followed as closely as actual construction and work of other trades will permit. Govern exact routing of cable and wiring and the locations of outlets by the

structure and equipment served. Dimensions shall be taken from Architectural Drawings.

- B Consult all other Drawings. Verify scales and report any dimensional discrepancies or other conflicts to architect, or engineer if no architect is involved, before submitting bid.
- C Home runs to panelboards are indicated as starting from the outlet nearest the panel and continuing in the general direction of that panel. Continue such circuits to the panel as though the routes were completely indicated. Terminate homeruns of signal, alarm, and communications system in a similar manner.
- D Avoid cutting and boring holes through structure or structural members wherever possible. Obtain prior approval of Architect and conform to structural requirements when cutting or boring the structure is necessary or permitted.
- E Furnish and install necessary hardware, hangers, blocking, brackets, bracing, runners, required for equipment specified under this section.
- F Provide necessary backing required to insure rigid mounting of outlet boxes.
- G Outlet boxes shall be plumb.
- H Back of wall plates shall be flush with wall finish. Gaps between wall plates and wall or wall plates not parallel to wall are not acceptable.

3.2 CONNECTIONS TO EQUIPMENT

- A General:
 - 1 Furnish and install required power supply conduit and wiring to equipment. See below for other wiring required.
 - 2 Install rough-in work for equipment from approved shop drawings to suit the specific requirements of the equipment.
 - 3 Furnish and install magnetic motor starters that are shown on the Drawings or specified under other divisions to be furnished under this division of work. Verify equipment nameplate ratings prior to installation and furnish adequately rated starters for the loads.
 - 4 Furnish and install manual thermal protection for motors not integrally equipped with thermal protection.
 - 5 Furnish and install 120V power to each control panel and time switch requiring a source of power to operate.
- B Heating, ventilating, and air conditioning equipment:
 - 1 Coordinate with mechanical contractor for sizes, locations and details of motors, heating units, and control requirements.
 - 2 Provide required power supply conduit and wiring to equipment.
 - 3 Provide a suitable means of disconnect switch immediately ahead of and adjacent to each motor and appliance unless the motor or appliance is located adjacent and within sight of the service panelboard, circuit breaker or switch at a distance allowed by codes. Verify equipment nameplate current ratings prior to installation. Provide a disconnect means at each magnetic motor starter.
 - 4 Provide magnetic motor starters required under this division of work.
 - 5 Provide manual thermal protection for motors not integrally equipped with thermal protection.
 - 6 Line and low voltage temperature control and interlock wiring, conduit, and required connections are a part of other divisions unless specifically shown or noted on the Drawings as to be furnished under this section.

- 7 Provide 120V power supply to control panels, time switch furnished and installed under other divisions of work.
- 8 Furnish and install 120V power to each duct detector scheduled for operation of fire dampers or shut down of mechanical equipment. Coordinate the exact quantity and locations with the mechanical drawings.
- C Plumbing and other contractor-furnished and Owner-furnished equipment:
 - 1 Required power and control conduit, wiring and connections are included under this section of the work. Control sensing and alarm devices will be furnished under the respective section of the contract supplying the equipment unless noted otherwise. These devices will be located in pipes, ducts, vessels, tanks, etc., and will be mounted in a place by the Contractor furnishing the devices. Other devices shall be mounted under this section of the work.
 - 2 Control panels for packaged equipment will be furnished under the respective section of the contract supplying the equipment unless otherwise noted. Installation and connection of the control panels are under this section of the work.

3.3 IDENTIFICATION

Refer to Section 260500.

END OF SECTION

SECTION 26 28 00

LOW VOLTAGE (0-600V) CIRCUIT PROTECTIVE DEVICES

PART 1 – GENERAL

1.1 SECTION INCLUDES

Materials, equipment fabrication, installation and tests in conformity with applicable codes and authorities having jurisdiction, for overcurrent protective devices

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

Published specification standards, tests or recommended methods of trade, industry or government organizations apply to work in this section as cited in Section 260000.

- A California Building Code
- B California Electrical Code
- C Institute of Electrical and Electronic Engineers
 - 1 IEEE 1015: Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems
 - 2 IEEE 1458: Recommended Practice for the Selection, Field Testing, and Life Expectancy of Molded Case Circuit Breakers for Industrial Applications
- D Underwriters' Laboratories
 - 1 UL 50: Enclosures for Electrical Equipment, Non-environmental Considerations
 - 2 UL 50E: Enclosures for Electrical Equipment, Environmental Considerations
 - 3 UL 98: Enclosed and Dead-front Switches
 - 4 UL 244A: Solid-state Controls for Appliances
 - 5 UL 363: Knife Switches
 - 6 UL 489: Molded-case Circuit Breakers, Molded-case Switches, and Circuit Breaker Enclosures
 - 7 UL 894: Switches for Use in Hazardous (Classified) Locations
 - 8 UL 977: Fused Power Circuit Devices
 - 9 UL 1066: Standard for Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures
 - 10 UL 2367: Standard for Solid State Overcurrent Protectors
 - 11 UL 2566: Low Voltage Surge Withstand Telecommunications Fuses

12 UL 60947-7-3: Low-Voltage Switchgear and Controlgear - Part 7-3:
Ancillary Equipment - Safety Requirements for Fuse Terminal Blocks

1.4 QUALITY ASSURANCE

- A Equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.
- B Supply equipment and accessories new, free from defects.
- C Equipment and accessories in compliance with the applicable standards listed in Article 1.3 of this section and with applicable national, state and local codes.
- D Items of a given type shall be the products of the same manufacturer.
- E Deliver, store and protect products under provisions of Section 016200.
- F Ship equipment in its original packages, to prevent damaging or entrance of foreign matter. Perform handling and shipping in accordance with manufacturer's recommendations. Provide protective covering during construction.
- G Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by the engineer.
- H Tag items with a weatherproof tag identifying equipment by name and purchase order number. Include packing and shipping lists.

1.5 SUBMITTALS

- A Submit under provisions of Section 013000 or 013300.
- B Submittals shall include the following:
 - 1 Table of contents
 - 2 A complete set of detailed manufacturer's specifications describing and illustrating all standard and special components and materials
 - 3 Part numbers
 - 4 Evidence of compliance with the applicable standards listed under Article 1.3 of this section
 - 5 Maintenance instructions and intervals
 - 6 A complete set of drawings for any special items
 - 7 Wiring diagrams
- C Electronic submittals shall be searchable
- D The submittal shall be substantially complete for all items and equipment furnished under this section.
- E Individual drawings and data sheets submitted at random intervals will not be accepted for review.
- F Substitutions: Items of same function and performance shall be submitted in conformance with Division 1.

1.6 OPERATION AND MAINTENANCE MANUALS

- A Submit operation and maintenance manuals in accordance with Section 260000.
- B The manuals shall, at minimum, include the following:
 - 1 Manufacturer (including contact information)
 - 2 Model number
 - 3 Manufacturer's data sheets – When data sheets include more than one model the model(s) used shall be noted
 - 4 Manufacturer's programming, user, and maintenance manual(s), including trouble-shooting guidelines

- 5 Configuration settings
- 6 Wiring diagrams
- 7 Voltage ratings
- 8 Current ratings
- 9 Calibrated range
- 10 List of capabilities
- 11 Environmental ratings
- 12 NEMA enclosure type
- 13 Maintenance requirements
- 14 Installation instructions
- 15 Repair instructions
- C Provide manuals in one of the following formats
 - 1 Three hardcopies
 - 2 PDF

PART 2 – PRODUCTS

2.1 CIRCUIT BREAKERS

- A Circuit breakers shall be constructed in accordance with the following standards:
 - 1 UL 489 or UL 1066
 - 2 Federal Specification W-C-375B/GEN
 - 3 NEMA AB1
 - 4 CSA 22.2, No. 5-M91
 - 5 IEC 157-1
 - 6 BS 4752
- B Construction
 - 1 Circuit breakers shall be constructed using glass reinforced polyester insulating material providing superior dielectric strength.
 - 2 Current-carrying components shall be completely isolated from the handle and the accessory mounting area.
 - 3 Breaker contact material shall be a non-weldable silver alloy.
 - 4 Breakers shall have arc-extinguishing chutes.
 - 5 Circuit breakers shall have an over-center, trip-free, toggle operating mechanism which will provide quick-make, quick-break contact action.
 - 6 Multiple pole breakers shall have a common trip element and a single operating handle.
 - 7 Circuit breakers for branch circuits shall be molded case
 - 8 Circuit breakers shall have bolt-on/plug-on type bus connectors.
- C Trip type
 - 1 Circuit breakers having a frame size of 150 amperes or less shall have thermal magnetic non-interchangeable, trip-free sealed trip units.
 - 2 Circuit breakers with a frame size of 175 amperes to 1200 amperes shall have interchangeable thermal and adjustable magnetic trip elements.
- D There shall be two forms of visible trip indication.
 - 1 The breaker handle shall reside in a position between ON and OFF.
 - 2 In addition, there shall be a red trip indicator appearing in the clear window of the circuit breaker housing.
- E Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the panelboard schedules.

- F Circuit breakers faceplates shall be marked with the following
 - 1 Rated ampacity
 - 2 UL and IEC certification standards
 - 3 Applicable voltage systems and corresponding AIR ratings
- G Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 90°C rated wire, sized according to the 75°C temperature rating per CEC Table 310-16.
- H Branch circuit breakers rated 30 amperes and below shall be UL Listed to accept 60°C rated wire.
- I The interrupting capacity of all main and feeder branch circuit breakers shall be a minimum of 42,000A_{RMS} symmetrical amperes.
- J All circuit breakers feeding HVAC units, motors, or circuit breakers supplying loads other than convenience receptacles or lights shall have lockout devices.
- K Standard circuit breakers up to 250A at 600V_{AC} shall be UL Listed with HACR ratings.
- L All circuit breakers feeding 120V, 15A and 20A branch circuits in dwellings shall be AFCI.
- M Circuit breakers with shunt-trip or low voltage release shall be switch duty rated.

2.2 SAFETY SWITCHES (DISCONNECTS)

- A Switches shall be heavy duty type
- B Minimum voltage rating shall be 600V.
- C Minimum Size
 - 1 Switches for disconnecting motors shall be sized for the horsepower of for motor(s).
 - 2 All switches shall be sized per the overcurrent protective device protecting the switch.
- D Construction
 - 1 NEMA 1 for indoors
 - 2 NEMA 3R or NEMA 4 for outdoors
 - 3 Handle shall be lockable in the off/disconnected/open position.
- E Switch shall be equivalent to Square D H-rated series.
- F Finish: The entire enclosure shall be finished as follows.
 - 1 Degreasing
 - 2 Cleaning
 - 3 Phosphatizing
 - 4 Electrostatic deposition of polymer polyester powder coating followed by baking to produce a hard durable finish.
 - a The minimum thickness of the paint film shall be 2.0 mils.
 - b Paint film shall be uniform in color and free from blisters, sags, flaking and peeling
 - 5 Finish shall conform to UL 50 and UL 50E.
 - 6 Color shall be ANSI 61 Gray.
 - 7 Coat underside surfaces of equipment outdoors or in damp locations with a corrosion resistant coating

PART 3 – EXECUTION

3.1 GENERAL

- A Electric system layouts indicated on the Drawings are generally diagrammatic, but shall be followed as closely as actual construction and work of other trades will permit. Govern exact routing of cable and wiring and the locations of outlets by the structure and equipment served. Dimensions shall be taken from Architectural Drawings.
- B Consult all other Drawings. Verify scales and report any dimensional discrepancies or other conflicts to architect, or engineer if no architect is involved, before submitting bid.
- C Furnish and install necessary hardware, hangers, blocking, brackets, bracing, runners, required for equipment specified under this section.

3.2 OVER CURRENT PROTECTION DEVICE COORDINATION STUDY

- A Contractor shall provide a coordination study to determine trip settings of circuit breakers and/or appropriate fuse types.
- B Fault, circuit overload, etc shall only trip closest circuit breaker or melt closest fuse. No other circuits shall be affected.

END OF SECTION

SECTION 27 11 00

COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 – GENERAL

1.1 SECTION INCLUDES

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.

The Contractor shall provide all necessary materials and labor for a complete, functional Telecommunications cabling infrastructure in accordance with all applicable standards and the Construction Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

- A. Governing Codes and Conflicts: If the requirements of the Construction Documents exceed those of the governing codes and regulations, then the requirements of the Construction Documents shall prevail. Where a conflict exists, the governing codes and ordinances shall supersede all other requirements.
- B. ANSI: American National Standards Institute (ANSI)
- C. CEC: California Electrical Code
- D. Electronic Components Association (ECA)
 - 1. ECA-310-E: Cabinets, Racks, Panels, and Associated Equipment
- E. Institute of Electrical and Electronic Engineers (IEEE)
 - 1. IEEE 802.3: IEEE Standard for Ethernet
 - 2. IEEE 802.3ad: Link Aggregation
 - 3. IEEE 802.3af: Power over Ethernet
 - 4. IEEE 802.3aq: 10 Gigabit Ethernet on FDDI-Grade Multimode Fiber (10G Base LRM)
 - 5. IEEE 802.3at: Enhanced Power over Ethernet
- F. Telecommunications Industries Association (TIA)
 - 1. TIA-455: General Requirements for Standard Test Procedures for Optical Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components
 - 2. TIA-472-0000: Generic Specification for Fiber Optic Cable

3. TIA-472-C000: Sectional Specification for Fiber Optic Communications Cable for Indoor Use
 4. TIA-472-D000: Sectional Specification for Optical Fiber Outside Plant Communications Cables
 5. TIA-472-E000: Sectional Specification for Indoor-Outdoor Optical Fiber Cable
 6. TIA-472-F000: Sectional Specification for Optical Fiber Drop Cable
 7. TIA-492-0000: Generic Specification for Optical Fibers
 8. TIA-492-AAAD: Detailed Specification for 850-nm, Laser Optimized, 50µm Core Diameter / 125µm Cladding Diameter, Class IA Graded-Index, Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fibers
 9. TIA-492-CAAB: Detailed Specification for Class IVA, Dispersion-Unshifted, Single-Mode, Optical Fibers with Low Water Peak
 10. TIA-526: Standard Test Procedures for Fiber Optic Systems
 11. TIA-526-2: Effective Transmitter Output Power Coupled into Single-Mode Fiber Optic Cable
 12. TIA-526-14: Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
 13. TIA-526-19: Optical Signal-to-Noise Ratio Measurement Procedures for Dense Wavelength – Division Multiplexed Systems
 14. TIA-568-C: Commercial Building Telecommunications Standard
 15. TIA-568-C.0: Generic Telecommunications Cabling for Customer Premises
 16. TIA-568-C.1: Commercial Building Telecommunications Cabling Standard
 17. TIA-568-C.2: Balanced Twisted-Pair Telecommunications Cabling and Components Standards
 18. TIA-568-C.3: Optical Fiber Cabling Components Standard
 19. TIA-568-C.3-1 Addendum 1: Addition of OM4 Cabled Optical Fiber and Array Connectivity
 20. TIA-569-C: Commercial Building Standard for Telecommunications Pathways and Spaces
 21. TIA-604: Fiber Optic Connector Interchangeability Standards
 22. TIA-606-B: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 23. TIA-607-B: Commercial Building Grounding and Bonding Requirements for Telecommunications
 24. TIA-758-B: Customer Owned Outside Plant Telecommunications Infrastructure Standard
 25. TIA-TSB-36: Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted-Pair Cables
 26. TIA-TSB-62: Informative Test methods for Fiber-Optic Fibers, Cables, Opto-Electronic Sources and Detectors, Sensors, Connecting and Terminating Devices, and Other Fiber-Optic Components
 27. TIA-TSB-63: Reference Guide for Fiber Optic Test Procedures
 28. TIA-TSB-149: Generic Workmanship Guidelines for Fiber Optic Connector Interoperability
 29. TIA-TSB-4979: Practical Considerations for Implementation of Encircled Flux Launch Conditions in the Field
- G. Underwriters Laboratories, Inc.

1. UL 50: Enclosures for Electrical Equipment, Non-environmental Considerations
2. UL 50E: Enclosures for Electrical Equipment, Environmental Considerations
3. UL 489A: Circuit Breakers for Use in Communications Equipment
4. UL 497: Protectors for Paired-conductor Communications Circuits
5. UL 497A: Secondary Protectors for Communications Circuits
6. UL 497B: Protectors for Data Communications and Fire Alarm Circuits
7. UL 497C: Protectors for Coaxial Communications Circuits
8. UL 497D: Component Secondary Protectors for Communications Circuits Used With Specified Voltage Suppression
9. UL 497E: Protectors for Antenna Lead-In Conductors
10. UL 1449: Surge Protective Devices
11. UL 1651: Standard for Optical Fiber Cable
12. UL 1655: Standard for Community-Antenna Television Cables
13. UL 1690: Standard for Data-Processing Cable
14. UL 1778: Uninterruptible Power Systems
15. UL 1801: Power Distribution Centers for Communications Equipment
16. UL 1863: Communications Circuit Accessories
17. UL 1977: Component Connectors for Use in Data, Signal, Control, and Power Applications
18. UL 2024: Standard for Signaling, Optical Fiber and Communications Raceways and Cable Routing Assemblies
19. UL 2269: Optical Fiber/Communications/Signaling/Coaxial Cable Outlet Boxes
20. UL 2416: Audio/Video, Information, and Communication Technology Equipment Cabinet, Enclosure, and Rack Systems
21. UL 2564: Low Voltage Surge Withstand Telecommunications Overcurrent Protector Components
22. UL 2566: Low Voltage Surge Withstand Telecommunications Fuses
23. UL 2567: Low Voltage Surge Withstand Telecommunications Polymer Positive Temperature Coefficient Thermistor (PPTC)
24. UL 2569: Low Voltage Surge Withstand Telecommunications Line Feed Resistor
25. UL 2570: Low Voltage Surge Withstand Telecommunications Electronic Current Limiters
26. UL 60950-1: Information Technology Equipment Safety – Part 1: General Requirements
27. UL 60950-22: Information Technology Equipment - Safety - Part 22: Equipment to be Installed Outdoors
28. UL 62368-1: Audio/video, information and communication technology equipment - Part 1: Safety requirements

1.4 QUALITY ASSURANCE

- A Contractor requirements:
- 1 The Contractor shall have successfully completed a minimum of 5 telecommunications projects of the same size and scope.
 - 2 Project Manager

- a The Project Manager shall have successfully completed a minimum of 5 telecommunications projects of the same size and scope.
 - b The contractor shall make the project manager available to the Owner/Owner's Representative before the start of this project for an interview. This person must be deemed acceptable by the Owner and/or their Representative before work can begin.
 - c Project Manager will be required to be available for scheduled on site project meetings at no additional cost to the Owner.
 - d Project Manager will be required to be available to meet on site with the Owner/Owner's representative with a minimum of 24 hours notice for non- emergency issues, and a minimum of 4 hours for emergency issues at no additional cost to the Owner.
- 3 Not Used.
- 4 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.
- 5 The Contractor shall provide all necessary materials and labor for a complete, functional Telecommunications cabling infrastructure in accordance with all applicable standards and the Construction Documents.
- B Material requirements
 - 1 All material and equipment to be installed on this project will be new and free from defects.
 - 2 Equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.
 - 3 New material shall meet the following requirements.
 - a Manufactured within one year of the installation date.
 - b Undamaged
 - c Not previously installed
 - d Delivered to jobsite in original packaging
 - e No corrosion or other degradation of material
 - f In factory condition
 - g Unmodified
 - 4 If used material or equipment has been installed on this project the Contractor shall replace said materials and/or equipment with new products at no additional cost to the Owner.
 - 5 Equipment and accessories shall be in compliance with the applicable standards listed in Article 1.3 of this section and with applicable national, state and local codes.
 - 6 Items of a given type shall be the products of the same manufacturer.
 - 7 Deliver, store and protect products under provisions of Section 016200.
 - 8 Ship equipment in its original packages, to prevent damaging or entrance of foreign matter. Perform handling and shipping in accordance with manufacturer's recommendations. Provide protective covering during construction.
 - 9 Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by the engineer.

- 10 Tag items with a weatherproof tag identifying equipment by name and purchase order number. Include packing and shipping lists.
- C Contractor shall warranty all materials, equipment, and workmanship for a minimum of one (1) year.
 - 1 Warranty shall provide repair/replacement of all defective or improperly installed materials at no additional cost to the Owner (including all costs to repair or replace the item(s)).
 - 2 Contractor shall provide a competent service technician and new materials to repair/replace defective items no later than 24 hours after notification.

1.5 SUBMITTALS

- A Submit under provisions of Section 013000 or 013300.
- B Submittals shall include the following:
 - 1 Table of contents
 - 2 A complete set of detailed manufacturer's specifications describing and illustrating all standard and special components and materials
 - 3 Part numbers
 - 4 Evidence of compliance with the applicable standards listed under Article 1.3 of this section
 - 5 Maintenance instructions and intervals
 - 6 A complete set of drawings for any special items
 - 7 A single line block diagram showing exactly the manner in which the contractor proposes to layout the system.
 - 8 Wiring diagrams
 - 9 Illustrations and scale drawing of the racks, equipment layouts etc.
 - 10 Drawings shall include designations, dimensions, operating controls, instruments, riser diagrams, routing diagrams etc.
- C Electronic submittals shall be searchable
- D The submittal shall be substantially complete for all items and equipment furnished under this section.
- E Individual drawings and data sheets submitted at random intervals will not be accepted for review.
- F Substitutions: Items of same function and performance shall be submitted in conformance with Division 1.

1.6 OPERATION AND MAINTENANCE MANUALS

- A Submit operation and maintenance manuals in accordance with Section 260000.
- B The manuals shall, at minimum, include the following:
 - 1 Table of contents
 - 2 Manufacturer (including contact information)
 - 3 Model number
 - 4 Programming manual (where applicable)
 - 5 Wiring diagrams
 - 6 Trouble-shooting guidelines (where applicable)
 - 7 Voltage ratings
 - 8 Current ratings
 - 9 Calibrated range (where applicable)
 - 10 List of capabilities

- 11 Environmental ratings
- 12 NEMA enclosure type
- 13 Maintenance instructions and intervals
- 14 Calibration procedures and intervals
- 15 Installation instructions
- 16 Repair instructions (where applicable)
- 17 As-built drawings
- C Provide manuals in one of the following formats
 - 1 Three hardcopies
 - 2 PDF

1.7 DEFINITIONS

- A. Horizontal Cross-connect (HC) A cross-connect of horizontal cabling to other cabling (e.g. horizontal, backbone, or equipment).
- B. Intermediate distribution frame (IDF): An intermediate distribution of horizontal cabling to other cabling (e.g. horizontal, backbone, or equipment).
- C. Main Cross-connect (MC): A cross connect for, 1st level backbone cables, entrance cables, and equipment cables. The Main Cross-connect is often co-located in the building Entrance Facility (EF) and/or Equipment Room (ER) and consisting of riser cable terminals, utility service cables terminals, PBS terminals, and other equipment.
- D. Main Distribution Frame (MDF): A main distribution for, 1st level backbone cables, entrance cables, and equipment cables. The Main Distribution-frame is often co-located in the building Entrance Facility (EF) and/or Equipment Room (ER) and consisting of riser cable terminals, utility service cables terminals, PBS terminals, and other equipment.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All IDF, MDF, et cetera shall be enclosed unless open racks are called out on the plans.
- B. Top of wall mounted IDFs shall be 18" below ceiling.
- C. Provide all necessary mounting hardware.
- D. All material shall be UL listed for its application.

2.2 ENCLOSURES AND RACKS

- A. Manufacturers
 - 1. APC
 - 2. Black Box
 - 3. Chatsworth Products, Inc.
 - 4. Cooper B-Line
 - 5. Hoffman Enclosures
 - 6. Hubbell Premise Wiring
 - 7. Southwest Data Products
- B. Main Distribution Frames

1. Four posts: Front and rear pairs of 3" deep C-shaped equipment mounting channels, 19" wide
 2. Minimum of 42 rack units
 3. 2000 pound static load capacity
 4. Provisions for anchoring to floor
 5. Zone 4 Seismic rated
 6. Provide and install a minimum of 6 shelves with the following requirements
 - a. 4 points of attachment
 - b. 200 pound capacity
 - c. Vented
 7. Mount a backboard on wall behind cabinet or rack
 - a. 48" wide by 96" high by 3/4" deep plywood
 - b. Mounting: 3/8"x2" long wood or self-tapping screw every 12" along wall stud
 - c. Paint with 3 coats of fire resistant paint.
 8. Fiber optic cable storage ring: Black Box FOSR24
 9. MDFs shall be floor mounted unless otherwise noted.
- C. Intermediate Distribution Frames
1. Four posts
 2. Minimum of 24 rack units
 3. 300 pound static load capacity
 4. Provisions for wall mounting
 5. Provide and install a minimum of 3 shelves with the following requirements
 - a. 4 points of attachment
 - b. 60 pound capacity
 - c. Vented
 6. 18" DIN rail
 7. Mount a backboard inside rear of cabinet (enclosed IDF) or on wall behind rack (open IDF)
 - a. 3/4" plywood
 - b. Mounting: 3/8"x2" long wood or self-tapping screw every 12" along wall stud
 - c. Paint with 3 coats of fire resistant paint.
 8. Fiber optic cable storage ring: Black Box FOSR12
 9. IDFs shall be wall mounted unless otherwise noted.
- D. Cabinets
1. General
 - a. Material: Steel
 - b. 18" DIN rail
 - c. Wall mounted cabinets shall be composed of three sections:
 - 1) Rear panel mounted to wall
 - 2) Main section shall be hinged on rear panel and include lock to secure in closed position to rear panel.
 - 3) Front door shall be hinged on main section and lockable in the closed position.
 - d. Hinges shall be reversible to allow swing open from the right or left.
 - e. The front door shall have rounded edges and corners.
 - f. Floor mounted cabinets shall have locking front and rear doors.

2. Enclosed rack/cabinet in cooled room
 - a. Top mounted ventilation fan(s)
 - 1) Minimum flow rate of 450 CFM for MDF cabinet
 - 2) Minimum flow rate of 225 CFM for IDF cabinet
 - b. MDF cabinets shall include 250 CFM enclosure blower.
 - c. Ventilation openings in sides or front
 - d. MDF cabinets shall have locking, mesh front and rear doors.
 - e. IDF cabinets shall have a locking front door with smoked poly-methyl-methacrylate window.
 - f. Install temperature switch in cabinet to turn the fan on at 100°F and off at 90°F.
3. Enclosed rack/cabinet outdoors or in non-cooled rooms
 - a. Enclosure shall have no openings.
 - b. Air conditioner
 - 1) The minimum size shall be 15,161 BTU/Hr.
 - 2) Contractor may have a licensed mechanical engineer calculate actual the heat removal required for enclosure size, insulation, 125% of the heat generated by equipment within enclosure, and any sunshades used to size air conditioner.
 - c. Provide and install insulation on interior of all sides and top of enclosure
 - 1) Insulation materials shall be non-flammable.
 - 2) Face of insulation shall be foil-scrim-kraft.
 - 3) Insulation shall be rigid.
 - 4) Insulation shall have a minimum R value of 6 at 1 inch thickness.
 - 5) Glue insulation to cabinet with high strength, non-flammable glue compatible with insulation. Refer to insulation manufacturer's literature.
 - 6) Cover any exposed fiber-glass with foil similar to face of insulation board. Glue to board with same glue used to glue board to enclosure.
4. Enclosures in wet or damp locations shall have no openings allowing moisture to enter enclosure.
5. Coating
 - a. The completed rack or cabinet shall be degreased and cleaned.
 - b. After the cleaning process is finished, the rack or cabinet shall be phosphatized.
 - c. After the phosphatizing, the rack or cabinet shall receive an electrostatic deposition of polyester powder coating followed by baking to produce a hard durable finish.
 - 1) The minimum thickness of the paint film shall be 2.0 mils.
 - 2) Paint film shall be uniform in color and free from blisters, sags, flaking and peeling
 - d. Finish shall conform to UL 50 and UL 50E.
 - e. Color shall be black for interior locations and ANSI 61 gray for exterior locations.
 - f. Coat underside surfaces of equipment outdoors or in damp locations with a corrosion resistant coating.
- E. Each rack unit space shall be identified on the racks/posts.

- F. The contractor shall calculate space requirements prior to ordering equipment. If the specified enclosure or rack is not large enough, the contractor shall order the size required for the equipment to be installed.

2.3 COPPER PATCH PANELS

- A. 48 Port, Category 6 patch panel: Panduit #CPP48WBLV
- B. Data ports
1. RJ45 design
 2. Terminate 26AWG to 22 AWG, stranded or solid, Cat-6 cables without punch-down tool
 3. Suppress alien cross-talk
 4. Maintain 10GB/S performance in 48 port, 1RU patch panels
 5. T568B wiring scheme
 6. Meet or exceed Cat-6A requirements of TIA-568-C.2 and IEEE 802.3an.
 7. Compatible with IEEE 802.3at POE+
 8. Snap in, snap out modular design
 9. Conductor retention and strain relief
 10. Gold plated contacts
 11. Manufacturer and models
 - a. Black: Panduit #CJ688TGBL
 - b. Blue: Panduit #CJ688TGBU
 - c. Green: Panduit #CJ688TGGR
 - d. Purple: Panduit #CJ688TGV
 - e. Red: Panduit #CJ688TGRD
 - f. White: Panduit #CJ688TGIW
 - g. Yellow: Panduit #CJ688TGYL
 12. Ports in patch panels shall be grouped by use (data, VOIP, clock/public address, etc.)
- C. Patch cords
1. RJ45 design
 2. Four twisted, unshielded, 23 AWG, solid pairs (23 AWG UTP)
 3. Suppress alien cross-talk
 4. Maintain 10GB/S performance
 5. T568B wiring scheme
 6. Meet or exceed Cat-6A requirements of TIA-568-C.2 and IEEE 802.3an.
 7. SRL, Attenuation and NEXT results shall use Sweep Frequency test per TIA-568-C.
 8. Compatible with IEEE 802.3at POE+
 9. Snagless latch on plugs
 10. Length shall be 12 inches
 11. Manufacturer and models
 - a. Black: Panduit #UTP28SP1BL
 - b. Blue: Panduit #UTP28SP 1BU
 - c. Green: Panduit #UTP28SP 1GR
 - d. Purple: Panduit #UTP28SP 1VL
 - e. Red: Panduit #UTP28SP 1RD
 - f. White: Panduit #UTP28SP 1IW
 - g. Yellow: Panduit #UTP28SP 1YL
- D. Colors for RJ45 ports and patch cables shall be:
1. Clocks: Green

2. Data: Blue
3. Energy management system: Purple
4. Power distribution units: Black
5. Servers: White
6. Speakers: Green
7. Surveillance: Red
8. Uninterruptable power supplies: Black
9. Wireless access points: Yellow
- E. Quantity: provide and install sufficient patch panels and patch cords to accommodate all devices with:
 1. 48 spare ports for MDFs
 2. 24 spare ports for IDF's
- F. Port identification: Panduit #C061X030FJJ

2.4 FIBER OPTIC PATCH PANELS

- A. Patch panel: Panduit #CFAPPBL1
- B. Fiber adapter panels (FAP)
 1. Multi-mode
 - a. OM4
 - b. 12 Duplex LC adapters per FAP
 - c. Zirconia ceramic, split sleeve ferrules
 - d. Color: Blue
 - e. Manufacturer: Panduit
 2. Single-mode
 - a. OS2
 - b. 12 Duplex LC adapters per FAP
 - c. Zirconia ceramic, split sleeve ferrules
 - d. Color: Green
 - e. Manufacturer: Panduit
- C. Install blank adapter panel in each unused space in the patch panel: Panduit #FAPB
- D. Fiber optic patch cords
 1. Cords shall have duplex LC connectors on one end and SFP connectors on other end.
 2. Length shall be 8 inches for patch panel adjacent to switch. Add 1.75 inches to length for each rack unit separating patch panel from switch.
 3. Multi-mode patch cords shall be OM4. Single-mode patch cords shall be OS2.
 4. Cord and connector colors shall match adapter colors.
- E. Quantity: provide and install sufficient devices to accommodate all backbone cable strands with:
 1. 36 spare terminals for MDFs
 2. 12 spare terminals for IDF's
- F. Port identification: Panduit #C061X030FJJ

2.5 TELCO SPLICE BLOCKS

- A. Where called out on plans provide and install a 50 pair, Type 66 Telco Splice Block; Black Box JP620 or equivalent.

- B. Quantity: provide and install sufficient splice blocks to accommodate 150% of phone lines terminating at MDF.
- C. All terminals shall be screw type.

2.6 POWER SUPPLIES

- A. IDF Uninterruptable Power Supply
 - 1. UPS shall be APC rack mountable Smart-UPS or Symmetra series.
 - 2. Refer to plans for size of UPS. If size is not shown on plans, size of UPS shall be 900VA per 48 port LAN switch.
 - 3. Provide and install APC AP9631 Network Management Card with Environmental Monitoring and APC AP9335TH temperature and humidity sensor.
 - 4. Provide and install Cat-6 patch cord from UPS to LAN switch.
- B. All UPS feeding data equipment shall have battery packs allowing for 30 minutes of runtime at full load during power outage.
- C. Power Distribution Units
 - 1. PDUs shall be rack mounted, switched outlet type with sequenced start-up.
 - 2. PDU(s) shall have a minimum of 8 5-15R and/or 5-20R per 2kVA of UPS capacity. Coordinate receptacle types with equipment being fed by PDU(s).
 - 3. Quantity of PDUs shall allow usage of full capacity of UPS.
 - 4. PDUs shall be capable of cycling power to each receptacle via network.
 - 5. Coordinate input type(s) of PDU(s) with output type(s) of UPS.
 - 6. Provide and install Cat-6A patch cord from each PDU to LAN switch.
- D. All UPSs and PDUs shall include the following features.
 - 1. Minimum of one RJ-45 Ethernet port
 - 2. SNMPv3, SSL, SSH
 - 3. Password protection
 - 4. User defined alarms with email alerting
 - 5. Load display
- E. Provide and install APC InfaStruxure Manager software and license for each UPS and PDU.

2.7 GROUNDING AND BONDING

- A. Grounding Busbar
 - 1. Grounding Busbars shall be 4" high by 12" wide by 0.25" thick solid copper bar.
 - 2. The busbar shall be 4" high and 12" long and shall have 18 attachment points (two rows of 9 each) for two-hole grounding lugs.
 - 3. The hole pattern for attaching grounding lugs shall meet the requirements of TIA-607-B and shall accept 30 lugs with 5/8" hole centers and 6 lugs with 1" hole centers.
 - 4. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators.
 - 5. The busbar shall be UL Listed as grounding and bonding equipment.
 - 6. Grounding Busbar shall be Chatsworth Products, Inc. 40153-012, or approved equal.
- B. Vertical Rack Busbar

- 1 Vertical, rack-mounted busbar shall be constructed of 1/4" thick by 5/8" wide, hard-drawn copper bar.
 - 2 Busbar shall be designed to mount into the channel of the rack without interfering with mounting of equipment on the rack.
 - 3 Bar shall have eight 6-32 tapped ground mounting holes on 1" intervals and four 0.281" holes for the attachment of two-hole grounding lugs.
 - 4 Busbars shall run entire height of rack.
 - 5 Busbars shall be Chatsworth Products, Inc. 40161-036 and/or 40161-072
- C Antioxidant Joint Compound
- 1 Aluminum to copper: Chatsworth Products, Inc. 40166-xxx
 - 2 Copper to copper: Chatsworth Products, Inc. 40168-xxx

2.8 SURGE SUPPRESSION

- A. Provide and install a 10 GB/S data-line surge suppressor for each data and VOIP cable entering a building: Phoenix Contact #DT-LAN-CAT.6+
- B. Provide and install a telephone line surge suppressor for each analog telephone line entering a building: Black Box #SP365A-R2 or equivalent

PART 3 – EXECUTION

3.1 INSTALLATION

- A Cabinets, racks, and enclosures
 - 1 Mount all cabinets and racks to walls or floors according to the Typical Electrical Details.
 - 2 Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.
- B Cable trays
 - 1 Cable trays must be securely attached to walls, backboards, and racks/cabinets to comply with all Zone 4 seismic requirements.
 - 2 Cable trays shall be installed so that there is a minimum of 8" of unobstructed clearance above rack.
 - 3 Cable trays shall be installed so that there is a minimum of 12" of clearance from all florescent lighting, electrical conduits/circuits, and fire alarm conduits/devices.
- C Rack mounted equipment
 - 1 Securely fasten all rack mounted equipment to each rack rail with a minimum of two screws per rail and according to manufacturers' recommendations.
 - 2 Patch panels shall be mounted to front pair of rack rails.
 - 3 PDUs shall be mounted to rear pair of rack rails.
 - 4 All other equipment shall be mounted to both pairs of rack rails.
 - 5 Alternate patch panels and switches so that each port in the patch panel is adjacent to the corresponding port in the switch.
- D Cable management
 - 1 Install vertical cable management raceways on each post of freestanding racks.

- 2 Install fiber optic storage ring on backboard behind each IDF/MDF or in rear of IDF cabinet. Loop each fiber optic cable round ring 3 times. Install ID tag on loop of each cable.
- E Grounding and Bonding
 - 1 Each MDF and IDF shall be equipped with a grounding busbar.
 - 2 Each grounding busbar shall be connected to the building electrical grounding facility per plans.
 - 3 All metallic equipment, including but not limited to, each rack, metallic backboard, cable sheath, metallic strength member, splice case, cable tray shall be grounded to its respective grounding busbar using a minimum #6 AWG stranded copper bonding conductor with a green insulation and compression connectors.
 - 4 Wall mounted grounding busbars
 - a Attach busbars to the wall with appropriate hardware according to the manufacturer's installation instructions and Typical Electrical Details.
 - b Conductor connections to the grounding busbar shall be made with two-hole bolt-on compression lugs sized to fit the busbar and the conductors.
 - c Each lug shall be attached with stainless steel hardware after preparing the bond according to manufacturer recommendations and treating the bonding surface on the busbar with antioxidant to help prevent corrosion at the bond.
 - d The wall-mounted busbar shall be bonded to ground as part of the overall Telecommunications Bonding and Grounding System.
 - 5 Rack-Mount Busbars and Ground Bars
 - a Each rack and cabinet shall be equipped with a vertical grounding busbar.
 - b Attach rack-mount busbars and ground bars to racks according to the manufacturer's installation instructions.
 - c Bond the rack-mount grounding busbar to the rack, cabinet, and room's grounding busbar with appropriately sized hardware and conductor.
 - 6 Equipment Ground Jumper Kit
 - a Bond equipment to a vertical rack-mount grounding busbar using ground jumper according to the manufacturer's recommendations.
 - b Clean the surface and use antioxidant between the compression lugs on the jumper and the rack-mount grounding busbar to help prevent corrosion at the bond.
- F Program UPSs, PDUs, and software to set alarms for current overload, temperature out of limits, and humidity out of limits and send email notification of alarm conditions.

3.2 LABELING

- A. The contractor shall follow the Owner's labeling scheme.
- B. Each IDF and MDF shall be labeled.
- C. Each IDF, MDF, patch panel, port, switch, and cable shall have a unique identification.
- D. Label each port on the patch panel and faceplate with its identification.

- E. Label each cable at its beginning and end points no further than 6" behind termination on a section of cable that is easily accessible. Cable labels shall include the ids of both terminations and cable id.
- F. Label the plug end of each power cord with id of equipment it feeds.
- G. Each faceplate shall be machine labeled. The labeling shall be placed on the faceplate so that the individual jack can be clearly identified by its associated label.
- H. All labels shall be machine printed. Handwritten labels are not acceptable.
- I. All labeling information shall be recorded on the as-built drawings and all test documents.

3.3 SYSTEM CLOSEOUT AND AS-BUILT DOCUMENTATION

- A. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Owner's Representative/Engineer for approval. One (1) to be a hardcopy and two (2) to be electronic copies. Documentation shall include the items detailed in the sub-sections below.
- B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 calendar days of the completion of each testing phase. At the request of the Owner's Representative/Engineer, the telecommunications contractor shall provide copies of the original test results.
- C. The Owner's Representative/Engineer will request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.
- D. Test Results documentation shall be provided in two media, as listed above, one (1) hardcopy and one (1) on disk within three weeks after the completion of the project. The documentation shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an bi-annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
- E. Printouts generated for each cable by the wire test instrument shall be submitted as part of the documentation package.
- F. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

- G The As-Built drawings are to include cable routes, outlet locations and the approved labeling identifiers. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD 2008) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.
- H Contractor will provide one laminated 11"x17" drawing at each IDF and MDF that includes the building layout for that IDF or MDF, along with the outlet locations and all of the approved labeling.

END OF SECTION

SECTION 27 15 00

COMMUNICATIONS HORIZONTAL CABLING

PART 1 – GENERAL

1.1 SECTION INCLUDES

This section includes material and workmanship requirements for data, telephone (analog and VOIP), IP clocks, and IP speakers horizontal cabling.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

- A. Governing Codes and Conflicts: If the requirements of the Construction Documents exceed those of the governing codes and regulations, then the requirements of the Construction Documents shall prevail. Where a conflict exists, the governing codes and ordinances shall supersede all other requirements.
- B. ANSI: American National Standards Institute (ANSI)
- C. CEC: California Electrical Code
- D. Institute of Electrical and Electronic Engineers (IEEE)
 - 1. IEEE 802.3: IEEE Standard for Ethernet
 - 2. IEEE 802.3ad: Link Aggregation
 - 3. IEEE 802.3af: Power over Ethernet
 - 4. IEEE 802.3at: Enhanced Power over Ethernet
- E. Insulated Cable Engineers Association (ICEA)
 - 1. ICEA S-84-608: Telecommunications Cables, Filled Polyolefin Insulated, Copper Conductor
 - 2. ICEA S-86-634: Buried Distribution and Service Wire, Filled Polyolefin Insulated, Copper Conductor
 - 3. ICEA S-102-700: ICEA Standard for Category 6 Individually Unshielded, Twisted Pair Indoor Cables (With or Without an Overall Shield) for Use in Communications Wiring Systems Technical Requirements
 - 4. ICEA S-103-701: Riser Cables Technical Requirements
- F. Telecommunications Industries Association (TIA)
 - 1. TIA-568-C: Commercial Building Telecommunications Standard
 - 2. TIA-568-C.0: Generic Telecommunications Cabling for Customer Premises

3. TIA-568-C.1: Commercial Building Telecommunications Cabling Standard
4. TIA-568-C.2: Balanced Twisted-Pair Telecommunications Cabling and Components Standards
5. TIA-569-C: Commercial Building Standard for Telecommunications Pathways and Spaces
6. TIA-606-B: Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
7. TIA-607-B: Commercial Building Grounding and Bonding Requirements for Telecommunications
8. TIA-758-B: Customer Owned Outside Plant Telecommunications Infrastructure Standard
9. TIA-1152: Requirements for Field Test Instruments and Measurements for Balanced Twisted Pair Cabling
10. TIA-1183: Measurement Methods and Test Fixtures for Balun-less Measurement of Balanced Components and Systems
11. TIA-TSB-36: Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted-Pair Cables
12. TIA-TSB-62: Informative Test methods for Fiber-Optic Fibers, Cables, Opto-Electronic Sources and Detectors, Sensors, Connecting and Terminating Devices, and Other Fiber-Optic Components
13. TIA-TSB-63: Reference Guide for Fiber Optic Test Procedures
14. TIA-TSB-67: TIA Telecommunications Systems Bulletin, Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware
15. TIA-TSB-149: Generic Workmanship Guidelines for Fiber Optic Connector Interoperability
16. TIA-TSB-155: Guidelines for the Assessment and Mitigation of Installed Category 6 Cabling to Support 10GBase-T
17. TIA-TSB-184: Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling
18. TIA-TSB-1197: Mode Conversion Parameters for Balanced Twisted Pair Cabling
- G. Underwriters Laboratories, Inc.
 1. UL 444: Communications Cables
 2. UL 1651: Standard for Optical Fiber Cable
 3. UL 1655: Standard for Community-Antenna Television Cables
 4. UL 1666: Standard for Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
 5. UL 1690: Standard for Data-Processing Cable
 6. UL 1863: Communications Circuit Accessories
 7. UL 1977: Component Connectors for Use in Data, Signal, Control, and Power Applications
 8. UL 2024: Standard for Signaling, Optical Fiber and Communications Raceways and Cable Routing Assemblies
 9. UL 2269: Optical Fiber/Communications/Signaling/Coaxial Cable Outlet Boxes
 10. UL 62368-1: Audio/video, information and communication technology equipment - Part 1: Safety requirements

1.4 QUALITY ASSURANCE

- A Contractor requirements:
- 1 The Contractor shall have successfully completed a minimum of 5 telecommunications projects of the same size and scope.
 - 2 Project Manager
 - a The Project Manager shall have successfully completed a minimum of 5 telecommunications projects of the same size and scope.
 - b The contractor shall make the project manager available to the Owner/Owner's Representative before the start of this project for an interview. This person must be deemed acceptable by the Owner and/or their Representative before work can begin.
 - c Project Manager will be required to be available for scheduled on site project meetings at no additional cost to the Owner.
 - d Project Manager will be required to be available to meet on site with the Owner/Owner's representative with a minimum of 24 hours notice for non- emergency issues, and a minimum of 4 hours for emergency issues at no additional cost to the Owner.
 - 3 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.
 - 4 The Contractor shall provide all necessary materials and labor for a complete, functional Telecommunications cabling infrastructure in accordance with all applicable standards and the Construction Documents.
- B Material requirements
- 1 All material and equipment to be installed on this project will be new and free from defects.
 - 2 Equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.
 - 3 New material shall meet the following requirements.
 - a Manufactured within one year of the installation date.
 - b Undamaged
 - c Not previously installed
 - d Delivered to jobsite in original packaging
 - e No corrosion or other degradation of material
 - f In factory condition
 - g Unmodified
 - 4 If used material or equipment has been installed on this project the Contractor shall replace said materials and/or equipment with new products at no additional cost to the Owner.
 - 5 Equipment and accessories shall be in compliance with the applicable standards listed in Article 1.3 of this section and with applicable national, state and local codes.
 - 6 Items of a given type shall be the products of the same manufacturer.
 - 7 Deliver, store and protect products under provisions of Section 016200.
 - 8 Ship equipment in its original packages, to prevent damaging or entrance of foreign matter. Perform handling and shipping in accordance with manufacturer's recommendations. Provide protective covering during construction.

- 9 Replace at no expense to Owner, equipment or material damaged during storage or handling, as directed by the engineer.
- 10 Tag items with a weatherproof tag identifying equipment by name and purchase order number. Include packing and shipping lists.
- C Contractor shall warranty all materials, equipment, and workmanship for a minimum of one (1) year.
 - 1 Warranty shall provide repair/replacement of all defective or improperly installed materials at no additional cost to the Owner (including all costs to repair or replace the item(s)).
 - 2 Contractor shall provide a competent service technician and new materials to repair/replace defective items no later than 24 hours after notification.

1.5 SUBMITTALS

- A Submit under provisions of Section 013000 or 013300.
- B Submittals shall include the following:
 - 1 Table of contents
 - 2 A complete set of detailed manufacturer's specifications describing and illustrating all standard and special components and materials
 - 3 Part numbers
 - 4 Evidence of compliance with the applicable standards listed under Article 1.3 of this section
 - 5 Maintenance instructions and intervals
 - 6 A complete set of drawings for any special items
 - 7 A single line block diagram showing exactly the manner in which the contractor proposes to layout the system.
 - 8 Wiring diagrams
 - 9 Drawings shall include designations, dimensions, operating controls, instruments, riser diagrams, routing diagrams etc.
- C Electronic submittals shall be searchable
- D The submittal shall be substantially complete for all items and equipment furnished under this section.
- E Individual drawings and data sheets submitted at random intervals will not be accepted for review.
- F Substitutions: Items of same function and performance shall be submitted in conformance with Division 1.

1.6 OPERATION AND MAINTENANCE MANUALS

- A Submit operation and maintenance manuals in accordance with Section 260000.
- B The manuals shall, at minimum, include the following:
 - 1 Manufacturer (including contact information)
 - 2 Model number
 - 3 Programming manual (where applicable)
 - 4 Wiring diagrams
 - 5 Trouble-shooting guidelines (where applicable)
 - 6 Voltage ratings
 - 7 Current ratings
 - 8 Calibrated range (where applicable)
 - 9 List of capabilities

- 10 Environmental ratings
- 11 NEMA enclosure type
- 12 Maintenance requirements
- 13 Installation instructions
- 14 Repair instructions (where applicable)
- C Provide manuals in one of the following formats
 - 1 Three hardcopies
 - 2 PDF

PART 2 – PRODUCTS

2.1 GENERAL

- A. All material shall be UL listed for its application.
- B. Cables shall be rated for its intended use, i.e. plenum, riser, wet location, etc.
- C. Cables, conductors, and all other components shall meet the requirements of standards listed in Section 1.3.

2.2 DATA AND VOIP HORIZONTAL CABLING

- A. Contractor shall provide, install, and test a Cat-6 cable link from each Data/VOIP Outlet directly to the IDF utilizing the hardware listed below (or approved equivalent) in full compliance with all applicable standards, local and national codes, manufacturers' recommendations, and otherwise noted within these specifications.
- B. Specifications:
 - 1. Four twisted, unshielded, 23 AWG, solid copper pairs (23 AWG UTP)
 - 2. Suppress cross-talk
 - 3. Maintain 10GB/S performance
 - 4. Meet or exceed Cat-6 requirements of TIA-568-C.2
 - 5. SRL, Attenuation and NEXT results shall use Sweep Frequency test per TIA-568-C.
 - 6. Have UL verification to Cat-6 specifications.
 - 7. Compatible with IEEE 802.3at POE+
 - 8. Colors for cables shall be:
 - a. Clocks: Green
 - b. Data: Blue
 - c. Energy management system: Purple
 - d. Power distribution units: Black
 - e. Servers: White
 - f. Speakers: Green
 - g. Surveillance: Red
 - h. Uninterruptable power supplies: Black
 - i. Wireless access points: Yellow
 - 9. Berk-Tek LANmark-1000 or approved equal
- C. Cables shall be rated for its intended use, i.e. plenum, riser, wet location, etc.
- D. Cables, conductors, and all other components shall meet the requirements of standards listed in Section 1.3.

- E. Provide all termination accessories, dressing accessories, enclosures, and testing for a complete fiber optic distribution system. Refer to Specification Section 271100.
- F. Identification
 - 1. Interior: Panduit S100X225YAJ self-laminating, polyester label
 - 2. Exterior: Panduit MT350W17-Q stainless steel tag with rounded edges & corners
- G. Contractor shall determine cable "link" quantities as shown on the Construction Documents.

2.3 ANALOG TELEPHONE HORIZONTAL CABLING

- A The Contractor shall provide, install, terminate, dress and test Category 5e cable "link" from Telephone Outlet to SCTB utilizing the hardware listed below (or approved equivalent) in full compliance with all applicable standards, local and national codes, manufacturers' recommendations, and otherwise noted within these specifications.
- B Specifications:
 - 1 Type: Category 5e, 24 AWG, 4-pair, plenum rated, UTP: Berk-Tek LANmark-350 or equal
 - 2 Color: Cable shall be gray in color.
 - 3 The cable shall exceed all applicable performance standards required by TIA-568-C compliance
 - 4 Have UL verification to Cat-5e specifications.
 - 5 SRL, Attenuation and NEXT results shall use Sweep Frequency test per TIA-568-C.
- C Identification
 - 1 Interior: Panduit S100X225YAJ self-laminating, polyester label
 - 2 Exterior: Panduit MT350W17-Q stainless steel tag with rounded edges & corners
- D Contractor shall determine cable "link" quantities as shown on the Electrical Construction Documents.

2.4 OUTLET HARDWARE

- A Data and VOIP Ports:
 - 1 Category 6, RJ45 port: Panduit CJ688TG##, or approved equivalent
 - 2 Colors for cables shall be:
 - a Clocks: Green
 - b Data: Blue
 - c Energy management system: Purple
 - d Power distribution units: Black
 - e Servers: White
 - f Speakers: Green
 - g Surveillance: Red
 - h Uninterruptable power supplies: Black
 - i Wireless access points: Yellow
 - 3 Terminate 26AWG to 22 AWG, stranded or solid, Cat-6 cables without punch-down tool
 - 4 Suppress cross-talk
 - 5 Maintain 10GB/S performance in 48 port, 1RU patch panels

- 6 T568B wiring scheme
- 7 Meet or exceed Cat-6 requirements of TIA-568-C.2
- 8 Compatible with IEEE 802.3at POE+
- 9 Snap in, snap out modular design
- 10 Conductor retention and strain relief
- 11 Gold plated contacts
- B Analog Telephone Ports:
 - 1 Category 5e, RJ45 port: Black Box FM923C, Panduit CJ5E88TGIG, or equivalent
 - 2 Color: Port shall be gray in color.
 - 3 Terminate 26AWG to 22 AWG, stranded or solid, Cat-5e cables without punch-down tool
 - 4 T568B wiring scheme
 - 5 Meet or exceed Cat-5e requirements of TIA-568-C.2 and IEEE 802.3.
 - 6 Compatible with IEEE 802.3at POE+
 - 7 Snap in, snap out modular design
 - 8 Conductor retention and strain relief
 - 9 Gold plated contacts
- C Wallplates:
 - 1 Material: Satin finish stainless steel
 - 2 For data or telephone – one module space: Black Box WP370 or equivalent
 - 3 For data and telephone – two module spaces: Black Box WP371, Panduit CFPL2SY, or equivalent
 - 4 For data and telephone – two module spaces: Black Box WP373, Panduit CFPL4SY, or equivalent
 - 5 Provide an install a blank module for each unused opening in the wallplates, Panduit CMBIG-X or equivalent.
 - 6 Labels: Panduit C125X030YPT self-adhesive, polyester label
- D Back box: 4 inch square box with one gang plaster

2.5 MISCELLANEOUS MATERIALS

- A Conduits: Refer to Section 260500.
- B Supports: Refer to Section 260529.
- C J-Hooks shall be steel with closure and two bolt holes. Finished part shall be hot dipped galvanized.

2.6 IDENTIFICATION

- A Interior: Panduit #S100X225YAJ self-laminating, polyester label
- B Exterior: Panduit #MT350W17-Q stainless steel tag with rounded edges & corners

PART 3 – EXECUTION

3.1 INSTALLATION

- A Cables

- 1 Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.
- 2 Contractor shall use Velcro strip to bundle cables together. Tie Wraps will not be allowed for supporting, bundling, and/or dressing of any cables.
- 3 Contractor shall provide a three foot service loop for all cables. The service loop will be coiled and secured using Velcro in the accessible ceiling at the conduit stub to the work area outlet box.
- 4 A 1/8" diameter, nylon pull cord shall be co-installed with all cable installed in any conduit.
- 5 Cable raceways shall not be filled greater than the TIA-569-C maximum fill for the particular raceway type or 40%.
- 6 Cables shall be installed in continuous lengths from origin to destination. Splices are not permitted.
- 7 Do not exceed the manufacturer's minimum bend radius and maximum pulling tension for cables.
- 8 Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.
- 9 Cables shall be dressed and terminated in accordance with the recommendations made in the TIA-568-C standards, manufacturer's recommendations, and best industry practices.
- 10 The cable jacket shall be maintained to within 1/2 inch of the termination point.
- 11 Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable every 3 feet.
- 12 Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.
- 13 All cables shall be neatly bundled and dressed continuously from the entrance point of the data room or cabinet to their respective panels. Each panel shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame. Cables in all other rooms shall be concealed.
- 14 Inside Buildings: Cable and conductors shall be routed in conduit, or surface mounted raceway, run overhead and parallel to the structure.
 - a Conduit shall be rigid steel, IMC, or EMT as described elsewhere in these specifications.
 - b Plastic conduit shall not be used above grade.
 - c Cable may be used behind accessible T-bar ceilings without conduit. Mount cable at the roof joist (or bottom of floor above) on 1" wide 'J-hooks' or 'bridle-rings' at every 5'-0" or less. Support each cable within 1'-0" of its termination point. Run cable parallel and perpendicular to the building structure and provide mechanical support for vertical runs by using Unistrut channel securely fastened in place.
 - d Cable and conductors shall not be attached to the support wire of the T-bar ceiling or laid across the ceiling boards.
- 15 Between buildings: Cable and conductors shall be routed in conduit run underground.
 - a Conduit shall be rigid steel, IMC, or plastic as described elsewhere in these specifications.

- b The use of EMT is not acceptable.
- 16 On The Roof: Conduit shown on the drawings as being on the roof of the building or covered walkway shall be installed on 4" by 4" pressure treated wood blocking (sleepers) attached to the structure every 8'-0" or less.
 - a Conduit shall be rigid steel or IMC as described elsewhere in these specifications.
 - b The use of EMT or plastic conduit is not acceptable.
- 17 Make all underground runs continuous without splices or taps. Use underground boxes for *pulling purposes only*.
- 18 Only use pulling grip approved by the cable manufacturer.
- 19 Clean conduit with mandrel prior to pulling.
- 20 Make all connections and splices in a clean environment.
- 21 Follow cable manufacturer's and device manufacturer's instructions for connections to devices.
- 22 Maximum combined cable length (patch cords and installed cable) from switch to end user equipment shall be 328 feet.
- 23 Stranded conductors shall be "tinned" with solder before terminations are made.
- 24 Make all terminations in cabinets and at terminal backboards on terminal blocks and/or Patch Panels as specified above.
- B Outlets Installation
 - 1 No more than 12" of cable shall be stored in an outlet box, modular furniture raceway, or insulated walls.
 - 2 Data jacks, unless otherwise noted in drawings, shall be located in the top position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the left-most position(s).
 - 3 Voice jacks, unless otherwise noted in drawings, shall occupy the next position(s) below the data on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the position right of the data jack.
 - 4 All faceplates installed shall be level.

3.2 LABELING

- A. The contractor shall follow the Owner's labeling scheme.
- B. Label each cable at its beginning and end points no further than 6" behind termination on a section of cable that is easily accessible. Cable labels shall include the ids of both terminations and cable id.
- C. All labels shall be machine printed or embossed. Handwritten labels are not acceptable.
- D. All labeling information shall be recorded on the as-built drawings and all test documents.
- E. Label all cable beginning and terminating points.
- F. Labels for site cables and cables in multiple buildings shall feature the following.
 - 1. Identify origin (MDF or IDF and building), termination (IDF or port identifier), and next pull box.
 - 2. Cables in pull boxes shall have a label at entry into pull box and exit from pull box. Labels shall be stainless steel tags with embossed characters.

3.3 TESTING

- A. General

1. All cables (including each fiber) and termination hardware shall be tested.
 2. Testing must comply with TIA standards for testing (refer to Section 1.3), plans, specifications, and manufacturer recommendations.
 3. Contractor shall notify the Owner or Owner's Representative 72 hours before commencement of testing.
 4. Upon receipt of the test documentation, the Customer reserves the right to have the contractor perform a 20% witnessed "spot testing" of the cabling system to validate test results provided in the test document, at no additional cost. If a significant amount of cables are marginal and/or fail during the "spot test" Contractor will retest the entire cable plant at no additional cost.
- B. Equipment
1. All equipment must be properly calibrated and traceable to NIST.
 2. Equipment shall have been recalibrated within the previous 6 month prior to testing.
- C. Data Copper Cables:
1. Each pair in each cable shall be tested in accordance with TIA-568-C series and TIA-TSB-67 for:
 - a. Opens
 - b. Shorts
 - c. Grounds
 - d. Continuity
 - e. Polarity
 - f. DC resistance
 - g. DC resistance unbalance
 - h. Impulse noise
 - i. Signal attenuation
 - j. NEXT
 - k. PS-NEXT
 - l. ELFEXT
 - m. PS-ELFEXT
 - n. Return loss
 - o. Propagation delay
 - p. Delay skew
 2. Each installed cable link shall be tested for installed length using a TDR type device. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number.
 3. Conductors and connectors shall be tested as a complete system.
 4. Testing of all horizontal cable, outlet ports, patch cords, and riser cable pairs shall include end-to-end tests using a Wavetech Lantec 100 or Fluke Network's DXT CableAnalyzer Series scanner.
 5. Test cables to check that they meet all IEEE and TIA Cat-6a and 10GB/S performance specifications (refer to Section 1.3).
 6. All installed cables must meet or exceed the defined standards for performance. The Contractor shall take all steps necessary to repair or replace any optic not meeting the standard.
 7. Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA standards.
 8. The test equipment shall provide a printed document for each test that is also available in a downloadable file using an application from the test

equipment manufacturer. The printed test results shall include a print out of all tests performed, and the individual test results for each cable.

3.4 SYSTEM CLOSEOUT AND AS-BUILT DOCUMENTATION

- A Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Owner's Representative/Engineer for approval. One (1) to be a hardcopy and two (2) to be electronic copies. Documentation shall include the items detailed in the sub-sections below.
- B Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 calendar days of the completion of each testing phase. At the request of the Owner's Representative/Engineer, the telecommunications contractor shall provide copies of the original test results.
- C The Owner's Representative/Engineer will request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.
- D Test Results documentation shall be provided in two media, as listed above, one (1) hardcopy and one (1) on disk within three weeks after the completion of the project. The documentation shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an bi-annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
- E Printouts generated for each cable by the wire test instrument shall be submitted as part of the documentation package.
- F When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.
- G The As-Built drawings are to include cable routes, outlet locations and the approved labeling identifiers. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD 2008) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.

- H Contractor will provide one laminated 11"x17" drawing at each IDF and MDF that includes the building layout for that IDF or MDF, along with the outlet locations and all of the approved labeling.

END OF SECTION

SECTION 28 31 00

FIRE DETECTION AND ALARM PART 1 – GENERAL

1.1 SECTION INCLUDES

- 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 system.
- B. The intent of drawings and specifications is to result in a complete and functional Fire Alarm System as described herein. The Contractor shall provide all control panels, initiation devices, notification appliances, controls, supervisory devices, and any other device necessary to accomplish this intent, whether or not specifically shown or specified.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A Division 1
 - 1 Section 013000: Administrative Requirements
 - 2 Section 013300: Submittal Procedures
 - 3 Section 014000: Quality Requirements
 - 4 Section 016000: Product Requirements
 - 5 Section 017000: Execution and Closeout Requirements
 - 6 All other included sections under Division 1
- B All included sections under Division 26
- C All included sections under Division 27
- D All included sections under Division 28
- E Plans
- F Manufacturers' manuals, product bulletins, etc.

1.3 REFERENCE STANDARDS AND CODES

- A. Published specifications standards, tests, or recommended methods of trade, industry or government organizations apply to work in this section as cited here and in Section 260000.
- B. National Fire Protection Association (NFPA) :
 - 1. NFPA 70 National Electrical Code (NEC)
 - 2. NFPA 72 National Fire Alarm and Signaling Code
 - 3. NFPA 101 Life Safety Code
- C. Underwriters Laboratories Inc. (UL):
 - 1. UL 38 Manually Actuated Signaling Boxes.
 - 2. UL 50: Enclosures for Electrical Equipment, Non-environmental Considerations
 - 3. UL 50E: Enclosures for Electrical Equipment, Environmental Considerations
 - 4. UL 268 Smoke Detectors for Fire Protective Signaling Systems
 - 5. UL 268A Smoke Detectors for Duct Applications.
 - 6. UL 346 Water flow Indicators for Fire Protective Signaling Systems.
 - 7. UL 464 Audible Signaling Appliances.
 - 8. UL 521 Heat Detectors for Fire Protective Signaling Systems
 - 9. UL 753: Alarm Accessories for Automatic Water Supply Control Valves for Fire Protection Service
 - 10. UL 864 Control Units for Fire Protective Signaling Systems

11. UL 1425: Standard for Cables for Non-Power-Limited Fire-Alarm Circuits
12. UL 1480: Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
13. UL 1481: Power Supplies for Fire Protective Signaling Systems
14. UL 1711: Amplifiers for Fire Protective Signaling Systems
15. UL 1712: Tests for Ampacity of Insulated Electrical Conductors Installed in the Fire Protective System
16. UL 1971 Visual Notification Appliances for the hearing impaired.
- D. Local and state building codes, including but not limited to:
 1. California Building Code
 2. California Electric Code
 3. California Fire Code
- E. All requirements of the Authority Having Jurisdiction (AHJ).

1.4 QUALITY ASSURANCE

- A. The FACP, initiation devices, monitoring devices, control devices, and annunciators shall:
 1. Be the product of a single U.S. manufacturer regularly engaged in its manufacture
 2. Share a common communications protocol
- B. All signaling devices shall be the product of a single U.S. manufacturer regularly engaged in its manufacture.
- C. All equipment and accessories shall be new and free from defects.
- D. Equipment and accessories in compliance with the applicable standards listed in Article 1.3 of this section and with applicable national, state and local codes.
- E. Provide surge suppression, refer to Section 264300.
- F. All components shall be UL listed.
- G. All components shall be CSFM listed.
- H. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
- I. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems, California Electric Code, California Fire Code, and all other state and local codes. The system shall be electrically supervised and monitor the integrity of all conductors.
- J. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.5 SUBMITTALS

- A. Submit under provisions of Section 013000 or 013300.
- B. Submittals shall include the following:
 1. Table of contents
 2. A complete set of detailed manufacturer's specifications describing and illustrating all standard and special components and materials
 3. Part numbers
 4. Evidence of compliance with the applicable standards listed under Article 1.3 of this section
 5. Maintenance instructions and intervals
 6. A complete set of drawings for any special items

7. A single line block diagram showing exactly the manner in which the contractor proposes to layout the system.
 8. Wiring diagrams
 9. Illustrations and scale drawing of the racks, equipment layouts etc.
 10. Drawings shall include designations, dimensions, operating controls, instruments, riser diagrams, routing diagrams etc.
- C. The shop drawing submittal shall include the following:
1. Plans, scale shall match scales of the approved plans
 - a. Site Plan
 - b. Floor Plans
 - (1) Identifying each room's use or occupancy
 - (2) Show device locations
 - (3) Show circuit routing
 2. Diagram of the power circuit.
 3. Riser Diagram, break down by zone or circuit.
 4. Point-to-Point diagram for all devices.
 5. Type of wire being used and that the wire is being run in conduit or FPL rated.
 6. Cut sheets for all devices, highlight actual devices to be used and their amp draw in stand-by and alarm modes.
 7. Current California State Fire Marshall listing sheets
 8. Battery Calculations for 24 hours and 5 minute alarm.
 9. Voltage-Drop Calculations.
 10. Indicate all the California State applicable codes relating to the fire alarm system:
 - a. Section 2-809 and Ch2-72, T-24 CBC.
 - b. Article 3-760, T-24 CEC.
 - c. Current Edition of NFPA 72.
 11. Provide documentation from Local Fire Jurisdiction approving Zone breakdown and location of any Fire Alarm Annunciators.
- D. Electronic submittals shall be searchable
- E. The submittal shall be substantially complete for all items and equipment furnished under this section.
- F. Individual drawings and data sheets submitted at random intervals will not be accepted for review.
- G. Substitutions
1. Items of same function and performance shall be submitted in conformance with Division 1.
 2. All proposed substitutions shall be listed with the California State Fire Marshal.
 3. All proposed substitutions shall require approval of the Division of the State Architect.

1.6 OPERATION AND MAINTENANCE MANUALS

- A Submit operation and maintenance manuals in accordance with Section 260000.
- B The manuals shall, at minimum, include the following:
- 1 Manufacturer (including contact information)
 - 2 Model number
 - 3 Programming manual (where applicable)
 - 4 Wiring diagrams

- 5 Trouble-shooting guidelines (where applicable)
- 6 Voltage ratings
- 7 Current ratings
- 8 Calibrated range (where applicable)
- 9 List of capabilities
- 10 Environmental ratings
- 11 NEMA enclosure type
- 12 Maintenance requirements
- 13 Installation instructions
- 14 Repair instructions (where applicable)
- C Provide manuals in one of the following formats
 - 1 Three hardcopies
 - 2 PDF

1.7 WARRANTY

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.

1.8 SUBSTITUTIONS

- A. For any proposed substitution a complete description, technical and cost comparison, and test report package shall be submitted to the Owner for review fifteen (15) working days prior to the bid date. Final approval of the substitution item shall be at the option of the Owner, and written notice of the status of the proposed alternative will be supplied to all bidders prior to the final bid date. The Owner or its representative must approve any proposed substitution item in writing. The Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by an independent testing consultant to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.
- B. Approved equal status does not imply final acceptance. The Owner prior to the award of bid shall make final acceptance of a substitution item to the successful Contractor, after reviewing the bid information.
- C. If a substitution item is given final acceptance by the Owner, the Contractor shall reimburse the Architect for any additional engineering charges and shall pay all charges of the other trades resulting from the substitution, at no cost to the Owner. This reimbursement shall include all costs required to obtain re-approval from DSA, as the currently specified fire alarm system has been approved in its entirety by DSA.
- D. If a substitution item is given final acceptance by the Owner, the Contractor shall pay all charges (including travel, lodging, meals, etc.) required to provide factory certification, equal to that of a Factory Authorized Distributor of the substituted item, for two (2) selected Owners representatives. This training shall occur at the primary factory of the substituted item in question and shall allow the selected Owners representatives to provide any and all Factory/Manufacturer Approved repairs, services, software upgrades, etc. without affecting any available or applicable Manufacturer Warranties.

- E. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment with the most current software package available at the time of installation. At the time of Owner Acceptance of the installation, all equipment shall include any and all updated software revisions. In addition, when the software is available in disk format, a backup copy of the most up to date revision, in disk format, shall be handed to the Owner at the completion of the project.

1.9 POST CONTRACT MAINTENANCE

- A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- 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.
- C. Maintenance and testing shall be on a semiannual basis or as required by the 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 14.

1.10 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 monitor modules and addressable 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.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include the cost of conventional peripherals or the cost of initiating devices or notification appliances connected to the addressable monitor/control modules.

- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

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 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. Fire alarm control panel: The contractor shall furnish and install all FACP accessories needed for the FACP to perform the following.
 - 1. Connect to all initiation and notification circuits shown on plans
 - 2. Network with other FACPs, annunciators, etc.
 - 3. Communicate with remote monitoring station
- E. Refer to plans for manufacturer(s), devices types and models to be used.

2.2 FIRE ALARM CONTROL PANEL (FACP)

- A. All fire alarm systems shall have one main FACP. Systems with more than one FACP will have main FACP indicated on plans. If it is not on plans, it is FACP in administration building.
- B. All satellite FACPs shall include the following equipment:
 - 1 Central processing unit
 - 2 Signaling line circuit (addressable initiation devices) interface(s)
 - 3 Notification appliance circuit interface(s)
 - 4 Network communications module(s)
 - 5 User interface
 - a 80 character, backlit LCD display
 - b Buttons
 - 1 Acknowledge
 - 2 Signal Silence
 - 3 Drill
 - 4 System Reset
 - 5 Lamp Test
 - c QWERTY keyboard
 - 6 Power supply (sized for all loads)
 - 7 Battery charger (sized for all loads)
 - 8 Batteries (sized for all loads)
 - 9 All accessories necessary for a fully functional system
- C. The main FACP shall include the following in addition to satellite FACP requirements.

- 1 User interface
 - a LCD display shall be 640 characters.
 - b Additional buttons
 - 1 Fire Alarm Scroll/Display
 - 2 Security Scroll/Display
 - 3 Supervisory Scroll/Display
 - 4 Trouble Scroll/Display
 - 5 Other Event Scroll/Display
 - 6 Print Screen
 - 7 Next/Previous Section
 - 8 Battery Level
 - c If the fire alarm system has a remote annunciator meeting user interface, the main FACP's user interface may be same as satellite FACP requirements.
- 2 Digital alarm communicator transmitter
- 3 Internet Protocol media access card
- 4 Computer interface software or firmware
- D The FACP and all accessories shall be housed in a cabinet size for all equipment.

2.3 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 760-55.
 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. Wires/Cables
 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 12 AWG.
 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 NFPA 70 (e.g., FPLR).

5. Wiring used for the multiplex communication circuit (SLC) shall be twisted and unshielded and support a minimum wiring distance of 12,500 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
6. All field wiring shall be electrically supervised for open circuit and ground fault.
7. The fire alarm control panel shall be capable of t-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs). Systems that do not allow or have restrictions in, for example, the amount of t-taps, length of t-taps etc., are not acceptable.
8. All wires shall be listed by the California State Fire Marshal (CSFM).
- C. Terminal Boxes, Junction Boxes and Cabinets. All boxes and cabinets shall be UL listed for their use and purpose.
- D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.
- E. 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.
- F. All fire alarm cables shall be listed with the California State Fire Marshal for use in a fire alarm system.

2.4 BATTERIES

- A. The battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
- 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 and 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 fire alarm boxes 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 ON-SITE START-UP

- A. System Check: Prior to energizing any part of this system, the factory authorized representative shall check thoroughly the installation, and perform pre-start checks. This representative shall check all points, fire alarm panels and complete network to ensure proper operation, and make any needed repairs and/or replacements required. Sufficient time shall be included in the project bid to cover all required start-up assistance and testing.
- B. Testing: The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment 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 14.
 - 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.
 - 12. The completed smoke detection system shall be tested to insure that it is operating properly. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the contractor shall readjust or replace the detector(s) and begin another ninety (90) day test period. As required by the architect, the contractor shall recheck the detectors after each readjustment or replacement of detectors. This test shall not start until the owner has obtained beneficial use of the building under tests.
- C. All test and report costs shall be in the contract price. A checkout report shall be prepared by the installation technicians and submitted in triplicate, one copy of

which will be registered with the equipment manufacturer. The report shall include, but not be limited to:

1. A complete list of equipment installed and wired.
 2. Indication that all equipment is properly installed and functions and conforms with these specifications.
 3. Test of individual zones as applicable.
 4. Serial numbers, locations by zone and model number for each installed detector.
 5. Voltage (sensitivity) settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.
 6. Response time on thermostats and flame detectors (if used).
 7. Technician's name, certificate number and date.
 8. NFPA Certification shall be completed, signed and submitted.
- D. The completed fire alarm system shall be tested to insure that it is operating properly. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the contractor shall readjust or replace the detector(s) and begin another ninety (90) day test period. As required by the architect, the contractor shall recheck the detectors after each readjustment or replacement of detectors. This test shall not start until the owner has obtained beneficial use of the building under tests.

3.3 FINAL INSPECTION

- A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment 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 and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."
- C. Appropriate quantities of installation and operation manuals shall be provided and used for instructional purposes.

3.5 RECORD DRAWINGS AND OPERATING MANUALS

- A. After completion of all the tests and adjustments listed above, the contractor shall submit the following information to the architect:
1. "As-built" conduit and cable layout diagrams including wire color code and/or tag number.
 2. Complete "as-built" site plans, floor plans, wiring diagrams, and calculations
 3. Detailed catalog data on all installed system components.
 4. Copy of the test report.
- B. Operating Manual:

1. Before final acceptance of work, the contractors shall deliver five copies of a composite "Operating and Shop Maintenance Manual." Each manual shall contain, but not be limited to: a statement of guarantee including date of installation and name and phone number of the person to be called in the event of equipment failure.
2. Individual factory issued manuals shall contain all technical information on each piece of equipment installed. In the event such manuals are not obtainable from the factory, it shall be the responsibility of the contractor to compile and include them. Advertising brochures or operational instructions shall not be used in lieu of the required technical manuals.

END OF SECTION

SECTION 31 20 00– EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to do all Earthwork and other related items necessary to complete the Project as indicated by Contract Documents unless specifically excluded.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 11 01 CONCRETE FORMWORK
 - 4. 03 20 00 REINFORCEMENT
 - 5. 03 30 00 CAST-IN-PLACE CONCRETE
 - 6. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 7. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data:
 - a. Information indicating the source of all import material, the fill material type and where it is to be used.
 - 2. Quality Assurance/Control:
 - a. Material Test Reports:
 - 1) Classification of Soils.
 - 2) Compaction Characteristics of Soils.
 - 3) Density and Unit Weight of Soils in Place.
 - 4) Environmental Contaminates Report.
 - 5) Import Soil:
 - a) Letter of certification from Owner's Testing Lab indicating material conforms to DTSC requirements.
 - b) Soil Test Results.
 - 3. Project Closeout: In accordance with Specification Section – PROJECT CLOSEOUT.
 - a. Drawings indicating the extent and depth of all engineered fill. This information shall be a part of the Project "As-Built" and Project "Record" Documents in accordance with the Specification Section – PROJECT DOCUMENTS.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer:
 - a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this project.
- B. Regulatory Requirements:

1. In accordance with Specification Section - REGULATORY REQUIREMENTS and the following:
 - a. AHJ Authority Having Jurisdiction
 - b. CAL/OSHA Comply with all provisions of the Construction Safety Orders and the General Safety Orders of the California Division of Occupational Safety and Health, as well as all other applicable regulations as they pertain to the protection of workers from the hazard of caving ground excavations.
 - c. DTSC California Department of Toxic Substances Control.
 - d. EPA Environmental Protection Agency.

C. Certificates:

1. Installer's certification that all Earthwork installation meets or exceeds the requirements of this specification.
2. Contractor's certification (on Contractor's letterhead paper) that the Earthwork materials and installation meets or exceeds the requirements of this specification.
3. Contractor and Supplier of imported material shall provide certification from the Owner's Testing Lab to certify that the soils do not contain any environmental contaminants regulated by Local, State or Federal Agencies. Cost of testing is the responsibility of the Contractor.

D. Meetings:

1. Pre-Installation: Schedule prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintaining installed work until the Notice of Substantial Completion has been executed.

1.4 PROJECT CONDITIONS

A. Existing Conditions:

1. Examine site and verify conditions with the Drawings and Specifications.
2. Thoroughly investigate and verify conditions under which the Work is to be performed.
3. Locate and identify utilities:
 - a. Call a Local Utility Locator Service (USA - "Underground Service Alert") for the task of locating any applicable off-site and on-site utilities in the area where the Project is located.
4. No allowance for extra Work will be granted resulting from negligence or failure to meet requirements of Article titled "Existing Conditions" above.

B. Environmental Requirements:

1. Dust control: Perform work in a manner as to minimize the spread of dust and flying particles. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors and concurrent performance of other on-site work.
 - a. All disturbed areas, including storage piles, which are not being actively utilized for construction purposes, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, or vegetative ground cover.

- b. All on-site unpaved roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.
 - c. All land clearing, grubbing, scraping, excavation, land leveling, grading, and cut and fill activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.
 - d. When materials are transported off-site, all material shall be covered, effectively wetted to limit visible dust emissions or at least six inches of freeboard space from the top of the container shall be maintained.
 - e. All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at least once every 24 hours when operations are occurring. The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. The use of blower devices is expressly forbidden.
 - f. Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/ suppressant.
- 2. Burning: No burning will be allowed on-site.
 - 3. Rain: Work under this section shall not be started or maintained under threat of rain, unless the work is not affected by the rain.
 - 4. Do not place fill during weather conditions which will alter moisture content of fill materials sufficiently to make compaction to the specified densities difficult or impossible.
 - 5. When reference is made to SWPPP (Storm Water Pollution Prevention Plan, if any within this Project Manual), then comply with all environmental protection requirements included therein.
 - 6. In accordance with EPA and AHJ.
- C. Protection:
- 1. Protect cut and fill areas to prevent water running into excavation. Maintain areas free of water. Remove seeping water immediately by pumps.
 - 2. Protect cut slopes from erosion due to precipitation and other sources of runoff.
 - 3. Protect utilities to remain within the construction area and special construction. If utility lines are uncovered (water, electric, sewer, etc.) not shown on the drawings during excavation of site, notify the Architect promptly for its review and action.
 - 4. Do not permit access to undeveloped portions of the site, nor to areas that are outside of the limits of grading.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Locator Tape:

- 1. Tape shall be an inert material such as polyethylene plastic with a metallic core, and highly resistant to alkalis, acids, or other chemical components likely to be encountered in soils. The tape shall be bright colors for contrast with the soils with identifying print in black letters. The tape shall be 6 inches wide and installed over all of the pipelines as shown on the drawings.

B. Earth Fill:

- 1. Fill shall consist of non-hazardous, non-expansive, low corrosivity and predominantly granular material composed of a reasonably well graded mixture of hard inert mineral fragments, approved by the Geotechnical Engineer.
- 2. Free of brush, roots, sod, rubbish or other organic materials or clay.

3. Free of rocks **3 inches** or larger in greatest dimension. Not more than **15 percent** larger than **2-1/2 inches**. Remove rock or stones, which may interfere with the action of compacting equipment.
 4. Materials excavated from the site below the top **twelve (12)** inches may be used, subject to approval by the Geotechnical Engineer.
 - a. On-Site materials shall be in accordance with Earth Fill paragraph within this specification section, and remove all roots **1/4 inch** in diameter or larger.
 - b. The moisture content of the soil shall be within two percent of optimum moisture content at the time of placement.
 5. Imported soil shall be predominantly granular material, as described in PART 2 paragraph titled IMPORT MATERIAL.
- C. Back Fill:
1. Mechanical and Plumbing Utility Trench Back Fill shall be soil in accordance with "Earth Fill" paragraph within this specification section.
 2. Electrical Utility Trench Back Fill shall be sand in accordance with "Sand Fill" (for Electrical Trenches) paragraph within this specification section.
 3. Lean Concrete: Refer to Specification Section – CAST-IN-PLACE CONCRETE.
- D. Sand Fill:
1. Sand to be washed and of natural siliceous or igneous origin, having hard, strong, and durable particles.
 2. Sand shall comply with ASTM C 33 "Standard Specification for Concrete Aggregates", generally as follows:
 - a. Percent passing 3/8-inch sieve: [100%].
 - b. Percent passing No. 4 sieve: [95 to 100%].
 - c. Percent passing No. 50 sieve: [10 to 30%].
 - d. Percent passing No. 100 sieve: [2 to 10%].

2.2 SOURCE QUALITY CONTROL

- A. Tests, Inspection:
1. Material Test Reports: Performed by the Owner's Testing Laboratory agency in accordance with the Specification Section – TESTING LABORATORY SERVICES, indicating and interpreting test results for compliance of the following with requirements:
 - a. Classification according to ASTM D 2487 "Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)," of each on-site and import soil material proposed for fill and backfill.
 - b. Laboratory compaction curve according to ASTM D 1557 "Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lb./sq. ft.)," for each on-site and import soil material proposed for fill and backfill.
 2. Material Test Reports: Performed by the Owner's Testing Laboratory agency in accordance with the Specification Section – TESTING LABORATORY SERVICES, indicating and interpreting test results for compliance of the following with requirements:
 - a. Imported soil: Test report showing import fill dirt chemicals are within allowable DTSC standards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions:

1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual, which affect the execution of work under this specification section.
2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION:

A. Layout of Work:

1. Contractor shall be responsible for all lines and grades.
2. Check all bench marks, monuments and property lines and verify locations.
3. Locate and maintain all grade stakes.
4. Monuments moved or displaced during grading operation are to be replaced by a California Registered Civil Engineer or Surveyor, at Contractor's expense.

B. Coordination:

1. Coordinate work under this specification section with work specified under other specification sections to ensure proper and adequate interface of work.

C. Protection:

1. Protect and maintain all benchmarks and survey control points from disturbance during clearing and demolition operations.
2. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
3. Protect existing improvements designated to remain from damage during construction.
 - a. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.3 CONSTRUCTION

A. Scarification and Compaction:

1. The exposed grade in areas to receive Earth Fill and Engineered Fill shall be scarified to a minimum depth of **six (6) inches**.
2. Moisture condition to within **two (2)** percent of optimum moisture content.
3. Compact to at least **ninety-two (92)** percent of the maximum dry density in accordance with ASTM D 1557 "Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lb./sq. ft.)."

B. Placing Earth Fill:

1. Shall occur after scarification and compaction operations.
2. Spread Earth Fill in successive layers that will result in compacted layers [**six (6) inches**] thick maximum.
3. Moisten or dry Earth Fill to obtain optimum moisture content for compaction. Add water as required to obtain uniform distribution of water to each layer. Disc soil to thoroughly mix after water is added.
4. Compact Earth Fill to a density of not less than [**ninety-two (92)**] percent in accordance with ASTM D 1557 "Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lb./sq. ft.)."
5. Compaction by ponding and jetting shall not be permitted.
6. Contractor shall be responsible for selection of equipment used for compaction, and for obtaining specified fill density.

7. Costs of initial compaction tests shall be borne by the Owner. Contractor shall pay for all re-tests required due to failure of initial tests.
- C. Excavation for Formwork:
1. Excavate for footings to depth and width indicate on the drawings or within these specifications.
 2. Protect top corners of trenches against sloughing.
 3. Side forms at footings may be omitted if excavation stands without caving. Make footing trench **two (2) inches** wider than width of concrete footing indicated on the drawings, when earth is used as a form. Cut trenches true and straight. Make side cuts neat and plumb. Bottom of trenches shall be level with reasonably sharp corners.
 4. When forms are required at footings, allow additional space for construction and inspection.
 5. Provide means to accurately position and secure sill bolts, tie downs, reinforcing, and all other inserts in concrete.
 6. Footings to bear on firm soil, as determined and approved by the Geotechnical Engineer.
 7. Notify the Architect if unsuitable bearing is encountered at depths indicated. After review and approval of the Architect and Geotechnical Engineer, continue excavation.
 8. Fill trenches excavated below indicated depths on drawings with concrete to required elevations. Concrete shall be in accordance with Specification Section - CAST-IN-PLACE CONCRETE.
- D. Trenching for Piping or Conduit:
1. Cut trenches true and straight. Make sides with neat cut. Bottom of trenches shall be uniform and in conformance with laying piping.
 2. Cut trenches wide enough to provide sufficient working space.
 3. Piping or conduit to bear on firm soil. Notify the Architect if unsuitable bearing is encountered at depths indicated on the drawings.
 - a. Sub-Base Support: Where installation of sub-base material is indicated, excavate to depth indicated or, if not otherwise indicated, a minimum of **six (6) inches** below bottom of work to be supported.
 - b. Excavate by hand below belling so that piping bears continuously on firm soil.
 4. Fill trenches excavated below required depths to required depths with Sand Fill, Earth Fill or Back Fill as required in accordance with article titled "Placing Back Fill" within this specification section.
 - a. Lean concrete shall be used as Back Fill where Utility Trenches extending from the exterior to the interior limits of building. Lean concrete shall extend a minimum distance of **two (2) feet** laterally on each side of the exterior building line and a minimum of **six (6) inches** above footing penetration.
- E. Protection of Excavations:
1. Provide all shoring and bracing as required and those codified in local, state or federal safety regulations.
 - a. OSHA Health and Safety Standards for Excavations.
 - b. Any other successor regulations.
 2. Prevent water, caving, or sloughing from entering excavation.
 3. Maintain excavations free of water.
- F. Placing Back Fill:
1. Remove all debris, wood, paper and deleterious materials from excavations before placing Back Fill.
 2. Do not backfill against foundation wall without Architect's approval and not until forms have been removed. Place Back Fill on each side simultaneously or brace one side.
 3. Do not Back Fill over piping until piping has been tested, inspected and approved.

4. Place Back Fill in accordance with article titled "Placing Earth Fill" within this specification section, or in accordance with article titled "Placing Engineered Fill" within this specification section, when Back Fill occurs within limits of Engineered Fill.
 - a. Compact around the lower haunches of piping without disturbing the pipe's line and grade.
 - b. Compact the fill to **ninety-two (92)** percent minimum **twelve (12) inches** above pipe or to **twenty-four (24) inches** of required grade, whichever is greater.
 - c. Compact the remainder of the fill to **ninety-two (92)** percent minimum, or as required by surface construction.
 - d. All compaction shall be in accordance with ASTM D 1557 "Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.-lb./sq. ft.)."
5. Jetting of trench backfill is not allowed.

3.4 FIELD QUALITY CONTROL

A. Site Tests:

1. Required field test reports on placed fill materials. Test will be performed by the Owner's Testing Laboratory Agency in accordance with the Specification Section – TESTING LABORATORY SERVICES.
2. Testing Agency will test compaction of soils in place according to ASTM D 1556 "Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method"; ASTM D 2167 "Standard test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method"; ASTM D 2922 "Standard test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)"; and ASTM D 2937 "Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method," as applicable. Tests will be performed at the following locations and frequencies:
 - a. Paved and Building Slab Areas: At sub-grade and at each compacted fill and Back Fill layer.
 - b. Foundation Wall Back Fill: At each compacted Back Fill layer.
 - c. Trench Back Fill: At each compacted initial and final Back Fill layer.
3. Costs of initial compaction tests shall be borne by the Owner. Contractor shall pay for all re-tests and re-inspection required due to failure of initial tests.

B. Inspection:

1. As required by Regulatory Requirements.
2. Schedule inspections and notify the Architect, Project Inspector and any other regulatory agencies of the time at least 48 hours prior to the inspection.
3. No work shall be without the inspections required by Regulatory Requirements.
4. Testing Agency: Owner will engage a qualified independent Geotechnical Engineering testing agency to perform field quality-control testing.
5. Allow testing agency to inspect and test sub-grades and each fill or back fill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

3.5 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

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1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and re-compact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, back fill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.6 CLEANING

- A. Disposal of Surplus and Waste Materials:
 1. Remove surplus satisfactory soil material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's Property.

END OF SECTION

SECTION 31 31 00– SOIL TREATMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to provide Termite Control and Herbicide, and other related items necessary to complete the Project as indicated by the Contract Documents unless specifically excluded.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 30 00 CAST-IN-PLACE CONCRETE
 - 4. 31 20 00 EARTHWORK
 - 5. 32 12 00 PAVEMENT
 - 6. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 7. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data for each type of product specified:
 - a. Include the EPA Registered Label showing the Active Ingredients and their percentages.
 - 2. Quality Assurance/Control Submittals:
 - a. Certificates:
 - 1) Indicating compliance with applicable regulations for all products, signed by product manufacturer.
 - 2) Installers Qualification for products specified.
 - b. Manufacturer's written Instructions for each type of product specified:
 - c. Test reports:
 - 1) Soil Treatment application.
 - 3. Closeout Submittals:
 - a. Project Record Documents in accordance with Specification Section - PROJECT DOCUMENTS.
 - 1) Identify and accurately locate extent of treatment on the Site Plans.
 - b. Warranty in accordance with Specification Section - WARRANTIES.
 - 1) Special Warranty specified within this specification section.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Material Qualifications:
 - a. All products shall comply with all applicable EPA regulations and standards in the place where the Project is located, and in effect at the time of application.
 - b. Obtain termite control products from a single manufacturer for each product.
 - 2. Installer Qualifications:
 - a. A specialist who is EPA approved and licensed according to regulations of authorities having jurisdiction to apply termiticides and herbicides in the jurisdiction where the project is located.
- B. Regulatory Requirements:

1. In accordance with Specification Section - REGULATORY REQUIREMENTS and the following:
 - a. EPA Environmental Protection Agency – All Applicable Environmental Protection Regulations and Standards.
 - b. USDA United States Department of Agriculture.
 - c. All products will comply with the current EPA laws and California Rules and Regulations at the time of application. Should the products listed become unavailable because of changes in the law, submit substitute products in accordance with Section - SUBSTITUTION PROCEDURES for review by the Architect.
 - C. Meetings:
 1. Pre-Installation: Scheduled by the Contractor prior to the start of work.
 - a. Coordinate the work with other work being performed.
 - b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
 2. Progress: Scheduled by the Contractor during the performance of the work.
 - a. Review for proper installation of work progress.
 - b. Identify any installation problems and acceptable corrective measures.
 - c. Identify any measures to maintain or regain project schedule if necessary.
 3. Completion: Scheduled by the Contractor upon proper completion of the work.
 - a. Inspect and identify any problems that may impede issuance of warranties or guaranties.
 - b. Maintain installed work until the Notice of Substantial Completion has been executed.
- 1.4 PROJECT CONDITIONS
- A. Environmental requirements:
 1. To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
 - B. Existing Conditions:
 1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
 2. Conduct work so as not to interfere unnecessarily with adjacent roads, streets, drives and walks.
- 1.5 SEQUENCING AND SCHEDULING
- A. Coordination:
 1. Coordinate soil treatment application with excavating, filling, grading, and concrete operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.
- 1.6 WARRANTY
- A. Contractor's General Warranty:
 1. In accordance with Specification Section - WARRANTIES.
 - B. Manufacturer's Warranty:

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1. Manufacturer's standard form, signed by Applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
2. In accordance with manufacturer's written standard warranty:
 - a. Warranty Period Five (5) Years.
 - 1) From the date of Substantial Completion.
- C. Installer's Warranty:
 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
- B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 TERMITICIDE

- A. PREMISE® 75 insecticide in water soluble packets as manufactured by BAYER CORPORATION, delivered in a minimum of a 0.1 percent solution as indicated by the label and in accordance with local environmental regulations, or approved equivalent.
 1. Active Ingredients:

a. Imidacloprid, 1-((6-Chloro-3-pyridinyl)methyl)-N-nitro-2-imidazolidinimine:	75.0 percent.
b. Inert Ingredients:	25.0 percent.
c. Total:	100.0 percent.
- B. WISDOM TC Flowable use a 0.06 percent emulsion for subterranean Termites.
 1. Active Ingredients:

a. Bifenthrin:	7.9 percent.
b. Other ingredients:	92.1 percent.

2.3 HERBICIDE

- A. Commercial chemical for weed control registered by the EPA and the State of California. Provide granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Termiticide:
 1. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.

- a. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings.
 1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION

- A. General:
 1. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.
- B. Applying Termiticide for Pre-Construction Treatment:
 1. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide per the soil conditions present, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticide barrier or treated zone is established around and under building construction. Distribute treatment evenly.
 - a. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 - 1) If the slab-on-grade construction is applied directly over the vapor retarder/barrier, then apply the termiticide just under the vapor retarder/barrier just prior to its placement. Spray all penetrations on top of the vapor retarder/barrier after it is placed and sealed, and just prior to the placement of the concrete.
 - 2) If the slab-on-grade construction is applied over a sand layer laid on top of the vapor retarder/barrier, then apply the termiticide directly over the sand layer just prior to the placement of the concrete.
 - b. Foundations: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 - c. Crawlspace: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
 - d. Masonry: Treat voids.
 - e. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
 2. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
 3. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

4. Post warning signs in areas of application.
5. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.
- C. Applying Termiticide for Post-Construction Treatment:
 1. New construction shall always require Pre-Construction Treatment.
 2. Only if the project involves Modernization and Termiticide
 3. Treatment is required, follow product label instructions for Post-Construction Treatment.
- D. Applying Herbicide Treatment:
 1. Extent of Herbicide Application: Soil under all asphaltic concrete paving, including driveways, parking areas, and athletic courts.
 2. Application:
 - a. Prepare substrate in accordance with manufacturer's written recommendations.
 - b. Apply Herbicide Solution over sub-base prior to application of asphaltic concrete.
 - c. Apply in form allowed by the EPA label.
 - d. Rate of Application: As recommended by the label.
 - e. Take all precautions to limit herbicide treatment to areas immediately under paved areas.

3.4 FIELD QUALITY CONTROL

- A. Soil Treatment Application Report: After application of soil treatment is completed, submit report for Owner's record information, including the following:
 1. Date and time of application.
 2. Moisture content of soil before application.
 3. Brand name and manufacturer of termiticide.
 4. Quantity of undiluted termiticide used.
 5. Dilutions, methods, volumes, and rates of application used.
 6. Areas of application.
 7. Water source for application.

END OF SECTION

SECTION 32 31 13 – CHAIN LINK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Provide all material, labor, equipment and services necessary to furnish and install Chain Link Fencing, Gates, Fittings and Accessories necessary to complete the Project as indicated by the Contract Documents.
- B. Related Sections: The following Project Manual Sections contain requirements that relate to this section:
 - 1. DIVISION 00 SPECIFICATION SECTIONS.
 - 2. DIVISION 01 SPECIFICATION SECTIONS.
 - 3. 03 30 00 CAST-IN-PLACE CONCRETE
 - 4. 31 20 00 EARTHWORK
 - 5. SPECIFICATION SECTIONS IN THE FACILITY SERVICES SUBGROUP.
 - 6. SPECIFICATION SECTIONS IN THE SITE AND INFRASTRUCTURE SUBGROUP.

1.2 REFERENCES

- A. Standards:
 - 1. In accordance with the following standards:
 - a. CLFMI Chain Link Fence Manufacturer's Institute

1.3 SYSTEM DESCRIPTION

- A. Fencing Requirements at Preschool and Pre-Kindergarten facilities:
 - 1. General: Fence installation shall eliminate pinch points and sharp elements.
 - 2. Cut all bolt threads flush, maximum two threads exposed.
 - 3. Smooth all rough edges or burrs within fenced play area.
 - 4. Provide plastic caps over all fence fabric edges and wires.

1.4 SUBMITTALS

- A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
 - 1. Product Data:
 - a. Posts, Rails, and Fittings.
 - b. Chain link Fabric, Reinforcements, and Attachments.
 - c. Gates, Hardware and Fittings.
 - d. Privacy Slats.
 - 2. Shop Drawings:
 - a. Includes dimension plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, operational clearances and footings.
 - b. Include coordination of the work in this section with that of related work of other sections for proper interface of the completed work.
 - 1) Coordinate and obtain approvals from the work of other related sections prior to submitting to the Architect.
 - 2) Furnish to contractor as noted under Specification Section - CAST-IN-PLACE CONCRETE for installation of:
 - a) Hook Bolts.
 - b) Drop Rod Receiver.
 - 3. Quality Assurance:

- a. Certificates:
 - 1) Materials Certification.
 - 2) Installer's Certification.
- 4. Closeout Submittals in accordance with the following:
 - a. Maintenance Data in accordance with Specification Section - PROJECT CLOSEOUT.
 - b. Project Record Documents in accordance with Specification Section - PROJECT RECORD Documents.
 - c. Warranty in accordance with Specification Section - WARRANTIES.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer/Supplier Qualifications:
 - a. Company operating in the United States, having U.S. Manufacturing facility/facilities, experienced in successfully producing/supplying products similar to that indicated for this Project for a minimum of five (5) years and with sufficient production/supply capacity to produce/supply required units without causing delay in the work.
 - 2. Installer Qualifications:
 - a. Company with successful experience installing similar projects and products in accordance with ASTM F 567 "Practice for Installation of Chain-Link Fence," and have at least five (5) years of experience.
- B. Regulatory Requirements:
 - 1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
 - a. CBC General Requirements:
 - 1) All gates within the Path of Travel (POT) shall meet all applicable accessible requirement specifications for doors, as defined by DSA/ACS and CBC Requirements.
- C. Certifications:
 - 1. Materials Certification: Complying with current ASTM specifications for all manufacturer's materials.
 - 2. Installer's Certification: certified in writing by the manufacturer listed herein as qualified to install manufacturer's product (or system) in accordance with manufacturer's warranty requirements.
- D. Preinstallation Meeting
 - 1. Conduct meeting at Project Site.
 - 2. Review coordination of work specified in the Section and elsewhere.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
 - 1. Deliver fabric, posts, rails, and other manufactured items so as not to be damaged or deformed. Package materials for protection during transportation and handling.
 - 2. Each length of chain-link fabric shall be tightly rolled and firmly tied.
 - 3. Each roll shall carry a tag showing the class of coating, the specified wire size, the mesh size, the length and height of fabric in the roll, ASTM A 392 "Specification for Zinc-Coated Steel Chain-Link Fence Fabric" and the name of mark of the manufacturer.
- B. Handling:
 - 1. Unload, and store materials in a manner to prevent bending, warping, twisting, and surface damage.
- C. Storage:

1. Stack materials on platforms or pallets, covered with suitable weather tight and ventilated covering to ensure dryness. Do not store materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences, and gates shown on the Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.8 WARRANTY

- A. Contractor's General Warranty:
 1. In accordance with Specification Section - WARRANTIES.
- B. Manufacturer's Warranty:
 1. In accordance with manufacturer's written standard warranty
 2. Manufacturer's standard form in which manufacturer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within the specified warranty period.
 - a. Failures include, but are not limited to, deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - b. Installer shall have manufacturers signed Certified Installer Agreement as a rider to the warranty.
 - c. Warranty Period from date of Substantial Completions: Five (5) Years.
- C. Installer's Warranty:
 1. In accordance with the terms of the Specification Section - WARRANTIES:
 - a. Warranty period Five (5) Years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fence:
 1. Fabric:
 - a. General: Steel Wire Fabric shall comply with ASTM A 392 "Specification for Zinc-Coated Steel Chain-Link Fence Fabric" and CLFMI Product Manual and with requirements indicated.
 - 1) Steel wire helically wound and interwoven in such a as to provide a continuous mesh without knots or ties.
 - 2) Fabric to be in one-piece heights measured between top and bottom of outer edge of selvage.
 - b. Wire:
 - 1) Standard: Use 9 gage (0.148 inch) copper bearing steel wire.
 - 2) Exception: Use 11 gage (0.120 inch) copper bearing steel wire at all tennis court enclosures.
 - c. Mesh Size:
 - 1) Standard: 2-inch mesh.
 - 2) Exception: Use 1-3/4" mesh at all tennis court enclosures.
 - d. Fabric Selvage: Knuckled at both top and bottom edges.
 - e. Protective Coating: ASTM A 392 "Specification for Zinc-Coated Steel Chain-Link Fence Fabric," Type II Zinc-Coated, Class 2 - 2.0 oz./sq. ft., galvanized by the hot-dip process after weaving.

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- 1) Quality to withstand 6 one-minute immersions per ASTM A 239 "*Standard Test Method for Locating the Thinnest Spot in a Zinc (Galvanized Coating on Iron or Steel Articles by the Preece Test (Copper Sulfate Dip).*"
- f. Strength: Wire in completed fabric after galvanization to have 7,000 pounds per square inch minimum tensile strength.
2. Posts:
 - a. General: All posts shall be round, seamless or continuously welded, steel pipe complying with ASTM F 1043 "Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework," Group IA, Table 3, Heavy Industrial Fence Framework, schedule 40 pipe per ASTM F 1083 "Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures."
 - 1) Protective Coating: Complying with Type A – Zinc Coated, min. 2.0 oz./sq. ft, per ASTM A 123 "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products," for exterior coating and interior coating after fabrication.
 - a) Zinc Coated, min. 4.0 oz./sq. ft, per ASTM A 653 "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanealed) by the Hot-Dip Process" for rolled-form shapes.
 - b. Line, and Terminal (end, corner, pull and gate) Posts:
 - 1) 2-3/8-inch O.D. (2.375 inch O.D.) 3.65 pounds per lineal foot.
 - 2) 2-7/8-inch O.D. (2.875 inch O.D.) 5.79 pounds per lineal foot.
 - 3) 3-1/2-inch O.D. (3.50 inch O.D.) 7.58 pounds per lineal foot.
 - 4) 4-inch O.D. (4.00 inch O.D.) 9.12 pounds per lineal foot.
 - 5) 4-1/2-inch O.D. (4.50 inch O.D.) 10.80 pounds per lineal foot.
 - 6) 5-9/16-inch O.D. (5.563 inch O.D.) 14.63 pounds per lineal foot.
 - 7) 6-5/8-inch O.D. (6.625 inch O.D.) 18.99 pounds per lineal foot.
 - 8) 8-5/8-inch O.D. (8.625 inch O.D.) 28.58 pounds per lineal foot.
3. Rails:
 - a. General: All rails shall be round, seamless or continuously welded, steel pipe complying with ASTM F 1043 "Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework," Group IA, Table 3, Heavy Industrial Fence Framework, schedule 40 pipe per ASTM F 1083 "Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures."
 - 1) Protective Coating: Complying with Type A – Zinc Coated, min. 2.0 oz./sq. ft, per ASTM A 123 "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products," for exterior coating and interior coating after fabrication.
 - a) Zinc Coated, min. 4.0 oz./sq. ft, per ASTM A 653 "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanealed) by the Hot-Dip Process" for rolled-form shapes.
 - b. Top, Horizontal and Bottom Rails:
 - 1) 1-5/8-inch O.D. (1.625 inch O.D.) 2.27 pounds per lineal foot.
4. Tension Wire:
 - a. Metallic Coated Steel Wire: Seven gage (0.177-inch diameter), marcelled tension wire complying with ASTM A 824 "Specification for Metallic-Coated Steel Marcelled Tension Wire for Use With Chain Link Fence."
 - b. Metallic Coating: ASTM A 817 "Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcelled Tension Wire," Type II Zinc-Coated, Class 5 – 2.0 oz./sq. ft., galvanized by hot-dip process.
5. Hook Bolts:
 - a. 3/8-inch diameter galvanized steel.
6. Tie Wires and Hog Rings:

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- a. Nine gage (0.148 inch diameter) galvanized steel wire, complying with ASTM F 626 "Specification for Fence Fittings." Galvanized minimum zinc coating of 1.2 oz/sq. ft.
- 7. Tension Bars:
 - a. 1/4 inch thick x 3/4 inch galvanized bar steel, complying with ASTM F 626 "Specification for Fence Fittings." Galvanized minimum zinc coating of 1.2 oz/sq. ft. by hot-dip process after fabrication.
- 8. Tension Bands:
 - a. 7/8 inch by 3/32-inch thick minimum galvanized band steel complying with ASTM F 626 "Specification for Fence Fittings." Galvanized minimum zinc coating of 1.2 oz/sq. ft. by hot-dip process after fabrication.
- 9. Truss Rod Assembly:
 - a. 3/8-inch diameter galvanized steel truss rod and galvanized turnbuckle for adjustment in compliance with ASTM F 626 "Specification for Fence Fittings." Galvanized minimum zinc coating of 1.2 oz/sq. ft. by hot-dip process after threading.
 - b. Assembly capable of withstanding a tension of 2,000 lbs.
- 10. Fittings:
 - a. General: In accordance with ASTM F 626 "Specification for Fence Fittings" and shall be hot-dip galvanized with a minimum of minimum of 1.2 oz/sq.ft., of zinc coating of surface area
 - b. Line and Terminal Post Caps: Fabricated from pressed steel or cast iron.
 - 1) Caps shall fit snugly over posts and exclude moisture from inside when tubular post are used.
 - 2) Provide Line Post Cap with loop to receive Tension Wire or Top Rail.
 - c. Rail and Brace Ends: Fabricated from pressed steel or round steel.
 - 1) Shall be provided when horizontal rail or brace are required.
 - d. Top Rail Sleeves: Fabricated from pressed steel or round steel.
 - 1) Rail sleeve material shall be a minimum of 0.051 inch in thickness and a minimum of 6 inches in length.
 - 2) Sleeve shall be fabricated to prevent movement along the rail.
 - e. Rail Clamps: Fabricated from galvanized pressed steel.
 - 1) Line and Corner Boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.
- B. Gates:
 - 1. General: All framing members shall be round, seamless or continuously welded, steel pipe complying with ASTM F 1043 "Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework," Group IA, Table 3 Heavy Industrial Fence Framework, schedule 40 pipe per ASTM F 1083 "Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures."
 - a. All frame corners (perimeter and interior) shall be of welded construction.
 - b. Frame members shall not be spaced no greater than 8 feet apart vertically and horizontally.
 - c. Protective Coating: Complying with Type A – Zinc Coated, min. 2.0 oz./sq. ft, per ASTM A 123 "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products," for exterior coating and interior coating, galvanized after fabrication.
 - 1) Zinc Coated, min. 4.0 oz./sq. ft, per ASTM A 653 "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanealed) by the Hot-Dip Process" for rolled-form shapes.
 - 2) Weld joints shall be coated with zinc-rich paint in accordance with ASTM A 780 "Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings."
 - d. Fabric: Shall be the same as specified for the Fence.
 - e. Truss Rod Assembly: Shall be the same as specified for the Fence.

2. Swing Gates:
 - a. General: Gate fabrication shall comply with ASTM F 900 "Specification for Industrial and Commercial Swing Gates."
 - b. Frame: Galvanized.
 - 1) 1-7/8-inch O.D. (1.875 inch O.D.) 2.72 pounds per lineal foot.
 - c. Hardware:
 - 1) Hinges: Galvanized malleable iron or heavy gage pressed steel post and frame hinges.
 - 2) Single Leaf Latch: Positive locking gate latch fabricated of 5/16 inch thick by 1-3/4-inch pressed steel, galvanized after fabrication and shall have provision for a padlock.
 - 3) Double Leaf Latch: 5/8-inch diameter galvanized Drop rod arranged to engage the gate stop. Locking device shall be constructed so the center drop rod cannot be raised when the gate is locked. Latching devices shall have provision for a padlock.
 - 4) Gate Stop: Fabricated from 1 inch diameter galvanized steel pipe and 2-inch galvanized metal washer.
 - 5) Keepers: Fabricated from galvanized malleable steel Gate Holdback and 1-5/8-inch diameter galvanized pipe with post cap.
 - 6) ADA Gate Lock: Rust-proof aluminum/stainless steel lock assembly with latching mechanism, levers (both sides), key lock (lockable from both sides), keepers (latch or stop), post adapters, spacers, chain-link holders, tension bands and fittings as required.
 - a) Lock cores per Specification Section – HARDWARE.
 - 7) Exit Door Gate: Galvanized exit door assembly with 16 gage x width as required steel plate, lock box, adjustable receiver bracket, guard and fittings as required.
 - a) Surface mounted Panic Bar per Specification Section – HARDWARE.
 - 8) ADA Gate Kick-Plate:
 - 9) 1/4-inch galvanized steel plate, minimum 10" high x width as required.
3. Rolling Gates:
 - a. General: Gate fabrication shall comply with ASTM F 1184 "Specification for Industrial and Commercial Slide Gates."
 - b. Frame:
 - 1) 1-7/8-inch O.D. (1.875-inch O.D.) 2.72 pounds per lineal foot.
 - c. Pipe Track and Bracket:
 - 1) 1-5/8-inch O.D. (1.625-inch O.D.) 2.27 pounds per lineal foot.
 - a) Galvanized Pipe Track Bracket and fittings as required.
 - d. Roller Assembly: Galvanized rear wheels, bolts, nuts, and bracket
 - e. Wheel Assembly: Double wheel carrier, galvanized with "U-Bolts" and eight (8) inch hard rubber wheels and fittings as required.
 - f. Steel AngleTrack: 1-1/2" x 1-1/2" x 1/8" galvanized steel with welded 3/8-inch diameter "J-Bolts" at 32 inches on center.
 - g. Guide Post: Galvanized.
 - 1) 2-7/8-inch O.D. (2.875 inch O.D.) 5.79 pounds per lineal feet.

C. Privacy Slats:

1. General:
 - a. Direction:
 - 1) Horizontal.
 - 2) Vertical.
 - 3) Diagonal.
 - 4) Horizontal / Vertical - screening between 92 percent to 96 percent.
 - 5) Horizontal / Diagonal - screening between 94 percent to 96 percent.
 - 6) Double Diagonal - screening between 96 percent to 98 percent.

- b. Width: Sized to fit the direction required, and the gage and fabric used.
- c. Length: In as long a length as practicable to keep splicing to a minimum.
 - 1) Keep waste to a minimum.
- 2. Fiberglass Privacy Slats: DURASLATT Fiberglass Fillerstrips, as manufactured by FRP SYSTEMS, for use as screening in chain link fencing, fabricated from a durable, semi-rigid fiberglass reinforced plastic, composed of glass fiber reinforcements, high quality polyester resins, pigments and fillers. Provide all privacy slat accessories (vandal-resistant fasteners and lock strips) as required for a complete and proper installation.
 - a. Material Physical Properties:
 - 1) Flexural Strength: 12,000 psi.
 - 2) Flexural Modulus: 1.0×10^6 psi.
 - 3) Tensile Strength: 8,000 psi.
 - 4) Tensile Modulus: 1.0×10^6 psi.
 - 5) Compressive Strength: 2,000 psi.
 - 6) Flame Spread: Less than 200.
 - 7) Ignition Point: 750 degrees - 800 degrees F.
 - b. Thickness: 0.6 inches nominal.
 - c. Width: Sized to fit the direction required, and the gage and fabric used.
 - d. Length: In as long a length as practicable to keep splicing to a minimum.
 - 1) Keep waste to a minimum.
 - e. Standard Color: As selected by the Architect from the manufacturer's standard color list.
 - f. Custom Color: As directed by the Architect.
- 3. Redwood Privacy Slats: 5/16 inch thick, sized to fit mesh specified for direction indicated.
- 4. Polyethylene Tubular Privacy Slats: Not less than 0.023 inch thick, manufactured for chain-link fences from virgin polyethylene containing UV inhibitor, sized to fit mesh specified for direction indicated; with vandal-resistant fasteners and lock strips.
 - a. Standard Color: As selected by the Architect from the manufacturer's standard color list.
 - b. Custom Color: As directed by the Architect.
- 5. Aluminum Privacy Slats: Not less than 0.01 inch thick, sized to fit mesh specified for direction indicated; with vandal-resistant fasteners and lock strips.
 - a. Standard Color: As selected by the Architect from the manufacturer's standard color list.
 - b. Custom Color: As directed by the Architect.
- D. Concrete:
 - 1. Footings: Site Concrete as specified in Specification Section – CAST-IN-PLACE CONCRETE.
 - 2. Non-shrink, Non-metallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107 "Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)." Provide grout, recommended in writing by manufacturer, for exterior applications.
 - 3. Erosion-Resistant Anchoring Cement: Factor-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure with needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.
- E. Accessories:
 - 1. Plastic Caps, sized to fit securely on fence wire fabric, as manufactured by STOCK CAP, or approved equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the work.
 - 1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Layout:
 - 1. Stake locations of fence lines, and terminal (end, corner, pull and gate) posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION

- A. General: Construct and install chain-link fencing in compliance with ASTM F 567 "Practice for Installation of Chain-Link Fence" and more stringent requirements indicated.
- B. Posts:
 - 1. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
 - 2. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - a. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - b. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - 1) Exposed Concrete Footing: Extend 2 inches above grade; shape and smooth to shed water.
 - 2) Concealed Concrete Footing: Stop 2 inches below bottom of material to allow covering top of footing.
 - 3. Terminal Posts: Locate terminal end, corner, gate posts, and locate terminal pull posts at changes in horizontal or vertical alignment of 30 degrees or more, unless noted otherwise.
 - a. End Corner, Pull and Gate Posts shall be braced and trussed for fabric 6 feet or higher, and for fabric 5 feet or higher at fencing without top rail.
 - 4. Line Posts: Space line posts uniformly not to exceed 10 feet on center.
- C. Rails:
 - 1. Top Rail: Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal and gate posts, maintaining plumb position and alignment of fencing. Provide expansion couplings as recommended in writing by fencing manufacturer.
 - a. Supply in lengths approximately 20 feet long and splice rail using top rail sleeves minimum 6 inches long.
 - b. Secure rail to end, corner, pull and gate terminal posts with a brace band and rail end.
 - 2. Brace Rail: Install brace rails between all end, corner, gate, and pull terminal posts and the first line posts, maintaining plumb position and alignment of fencing. Securely attach to post with fittings.
 - a. Locate horizontal braces at mid-height of fabric greater than 72 inches in height, on fences with top rail and at two-third fabric height on fences without top rail.
 - 1) Spacing of brace rails not to exceed 6 feet on center vertically,

3. Horizontal Rail: Install horizontal rails between all line posts, maintaining plumb position and alignment of fencing. Securely attach to posts with fittings.
 - a. Locate horizontal rails at mid-height of fabric 12 foot or higher,
 - 1) Spacing of horizontal rails not to exceed 12 feet on center vertically,
4. Bottom Rails: Install and secure to posts with fittings.
- D. Truss Rod Assembly:
 1. Diagonally brace all end, corner, pull and gate terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
 2. Install so posts are plumb when diagonal rod is under proper tension.
- E. Tension Wire:
 1. Furnish and be responsible for accurate placement of Hook Bolts for installation in mow strip at mid-point between Line Posts.
 2. Pull wire taut, without sags, independently and prior to the Fabric, between the terminal Posts and secured to the terminal Post using a brace band. Secure the tension wire to the chain link fabric with a hog rings a 18 inches on center and to each line post with a tie wire, maintain plumb position and alignment of fencing. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations
 - a. Extended along bottom of fence fabric. Install bottom tension wire within 4 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
 - b. Hook Tension Wire thru Hook Bolts.
- F. Fabric:
 1. Apply Fabric to outside of enclosing framework. Leave a maximum of 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated. Pull Fabric taut and tie to Posts, Rails, and Tension Wires. Anchor to framework so fabric remains under tension after pulling force is released.
- G. Tension or Stretcher Bars: Thread through Fabric and secure to end, corner, pull, and gate Posts with Tension Bands and 5/16-inch diameter carriage bolts at 12 inches on center maximum.
- H. Tie Wire and Hog Rings: Use wire of proper length to firmly secure Fabric to line Posts, Rails, Truss Rod Assembly and Tension Wire per ASTM F 626 "Specification for Fence Fittings."
 1. Fasten Fabric to Line Post with Tie Wire at 12 inches on center maximum.
 - a. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric.
 - b. Bend ends of wire to minimize hazard to individuals and clothing.
 2. Fasten Fabric to Rails (top, brace, horizontal and bottom) with Tie Wire at 18 inches on center maximum.
 3. Fasten Fabric to Tension Wire with Hog Rings, spaced a maximum of 18 inches on center.
- I. Gates:
 1. General: Installation of gates and gate posts in compliance with ASTM F 567 "Practice for Installation of Chain-Link Fence."
 2. Gates shall be level, plumb and secure for full operation without interference.
 - a. Attach fabric as for fencing.
 - b. Attach hardware using tamper-resistant or concealed means.
 - c. Furnish and be responsible for accurate placement of ground-set items in concrete mow strips.
 - d. Adjust hardware for smooth operation and lubricate where necessary
 3. Swing Gates:
 - a. Gates have a bottom clearance of 3 inch in the closed position, grade permitting.
 - b. Hinge and latch offset opening space from the gate frame to the post shall be no greater than 3 inches in the closed position.
 - c. Gate leaf holdbacks shall be installed for single gates 5 feet or greater in width and all double gates, unless noted otherwise.

4. Rolling Gates: Install gate according to manufacturer's written instructions, aligned and true to fence line and grade
 - a. Gates have a bottom clearance of 3inch in the closed position, grade permitting.
 - J. Fasteners:
 1. All fasteners shall be installed with the smooth side on the secure side of the fence.
 - a. All bolts shall be peened over to prevent removal of the nut.
 - K. Privacy Slats:
 1. Install in accordance with manufacturer's written requirements, in the color and direction as selected by the Architect. Keep lengths of slats as long as practical, and keep waste to a minimum.
- 3.4 ADJUSTMENT
- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
 - B. Lubricate hardware and other moving parts.
- 3.5 CLEAN UP
- A. The area of the fence line shall be left neat and free of any debris caused by the installation of the fence.

END OF SECTION

APPENDIX B

Project: Child Nutrition
 Client: Madera Unified School District
 Location: Madera, CA

Darden Project # 2310

APPENDIX "B": INTERIOR COLOR SCHEDULE

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
<i>MODULAR CASEWORK</i>			
Plastic Laminate			
Countertop/Splash	Wilsonart	D427-60	Linen
Base Cabinet	Wilsonart	7911-60	Manitoba Maple
Wall Cabinet	Wilsonart	7911-60	Manitoba Maple
Tall Cabinet	Wilsonart	7911-60	Manitoba Maple
Door	Wilsonart	7911-60	Manitoba Maple
Drawer	Wilsonart	7911-60	Manitoba Maple
Face Panel	Wilsonart	7911-60	Manitoba Maple
End Panel	Wilsonart	7911-60	Manitoba Maple
Back Panel	Wilsonart	7911-60	Manitoba Maple
Shelves	Wilsonart	7911-60	Manitoba Maple
Edge Banding	Wilsonart	7911-60	Manitoba Maple
Solid Surfacing	Corian	-	Modern White
Translucent Panel	3form	G20	Nomad
<i>STOREFRONT</i>			
Door	Kawneer	-	Clear Anodized
Frame	Kawneer	-	Clear Anodized
<i>TILE</i>			
Ceramic, Interior Wall Tile			
Color 1	Daltile	0190	Arctic White (Kaleidoscope)
<i>Grout to be Mapei 38 Avalanche</i>			
Accessories, Metal Trim	Schluter	-	Clear Anodized
<i>RESILIENT BASE AND ACCESSORIES</i>			
Rubber Base	Mannington	628	Ore
<i>RESINOUS FLOORING</i>			
Resinous Floor	Stonhard	-	Ash
<i>WALL COVERINGS</i>			
Fiberglass Reinforced Panels	Crane Composites	-	White (Smooth)
<i>PAINT</i>			
Gypsum Board (New and Existing)			
Color 1	PPG	PPG1001-2	Aria
<i>Unless otherwise noted.</i>			
Color 2	PPG to match Dunn Edwards	DE5235	Blazing Autumn

Project: Child Nutrition
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Darden Project # 2310

APPENDIX "B": INTERIOR COLOR SCHEDULE

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
Color 3	PPG to match Dunn Edwards	-	Paint to match existing adjacent
<i>Refer to attached drawing A1-A/A801. Color 3 to occur at Entry 101 and Production 117 only</i>			
Metal Doors/Frames (New and Existing)			
Metal Doors/Frames	PPG	-	Match to adjacent
<i>Unless Otherwise Noted. Door 102c to match existing adjacent door.</i>			
Steel and Fabrications	PPG to match	-	Paint to match adjacent
Mechanical	PPG to match	-	Paint to match adjacent
Millwork	Stain to match Wilsonart	7911-80	Manitoba Maple
<i>MISCELLANEOUS SPECIALTIES</i>			
Dimensional Letters/Logo			
Color 1	3form	G20	Nomad
Color 2	3form	Y07	Couscous
<i>WALL AND CORNER GUARDS</i>			
High Impact Wall Covering	Inpro	0382	Meadow

APPENDIX "B": INTERIOR COLOR SCHEDULE

<u>MATERIAL</u>	<u>MANUFACTURER</u>	<u>REF #</u>	<u>DESCRIPTION</u>
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GENERAL NOTES:

- 1 The intent of this schedule is to clarify and detail the color and patterns of finishes. All information regarding construction conditions, casework, framing and ceiling details, etc. shall be per Architectural plans, unless otherwise noted.
- 2 Interior Color Schedule to be used in conjunction with Architectural plans and Specifications.
- 3 Paint colors listed on Interior Color Schedule are for color reference only. Refer to Architectural Specifications and Finish Schedules for information regarding paint systems.
- 4 Change of paint color to occur on an inside corner, unless otherwise noted.
- 5 All gypsum board surfaces to be painted Color 1, unless otherwise noted.
- 7 All access doors and frames to be painted to match color of adjacent surface.
- 8 All miscellaneous exposed to view metal and mechanical equipment receiving a field finish to be painted to match color of adjacent surface.
- 9 All accent paint, changes in paint color and extent of paint and accent paint to be verified by Darden Architects at job site prior to commencement of work.
- 10 Samples and mock-up of each polished concrete color must be provided to, and approved by, Darden Architects prior to commencement of work.
- 11 All finishes to extend inside accessible base cabinets.
- 12 All modular casework edge banding to match adjacent plastic laminate.
- 13 All paints and stains are to be submitted in the form of brush outs to Darden Architects for approval prior to commencement of work.